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VIEWS, NEWS AND INTERVIEWS.

It was in a florist's shop not far from the Rialto that the following exhibition of the well known American curiosity was well given. Two incandescent lamps, surrounded by delicate cut glass shades, suspended by their silk conductors, swung vigorously to and fro from their ornamental sockets. Each time that the crystal globes drew near to each other it seemed as if they would crash together and splinter into thousands of scintillating fragments. It was new; it was exciting, and one person stopped. That was the signal. First one and then another passer-by became a spectator. Hurrying shoppers paused. A few Hamlets and two or three Juliets tarried in their wild rush for fame.

Still the crystal globes swung backwards and forwards, and every time they approached each other the timid spectators got a good grip on their hearts, which had unaccountably slid up into their throats. But they didn't smash; not a break.

Then the remarks poured in thick and fast.

"Yer see," said the newsboy, who had evidently listened to a lecture on electricity in the Bowery, "it's the electricity wot does it."

Two shop girls cast on the unfortunate newsboy a look of supreme contempt.

"Say, Maggie," said one, "there's an invisible wire gauze between them globes; that's why they don't hit."

One smooth shaven Hamlet looked down in his superior wisdom and condescendingly remarked to his companion in misery, in a 30-dollar-a-week voice, "You may break, you may shatter other globes if you will, but those cut-glass globes will swing round there still."

Poor fellow, he meant well, but he did not know any better. But the globes didn't smash.

The crowd swelled. Finally everyone had an explanation. No two, however, were alike.

Some one suggested asking the florist, but he was crowded out. At last the inquisitive loiterers dispersed, and the REVIEWITE taking a close look at the swinging globes, noticed that they were suspended by cords too short to allow them to come in contact, and made a little note in his book which confirmed Puck's celebrated motto, "What fools these mortals be."

The Schuyler Electric Company, of Middletown, Conn., is making a search-light 9½ feet high, said to be the largest in the world.

The directors of the Pittsburgh Electric Club met on the evening of May 6 and elected the following officers: President, Morris W. Mead; vice-president, John Campbell. House committee, Dr. Adolph Koenig, Prof. H. P. Ecker, E. P. Austin. Membership committee, John E. Ridall, G. H. Blaxter, D. W. Dunn.

"Many of our customers use incandescent electric lights only during the summer months when the heat from gas jets would be an inconvenience," said the manager of a large central station in this city. "They prefer gas in the winter time because it helps to heat their stores, besides giving light."

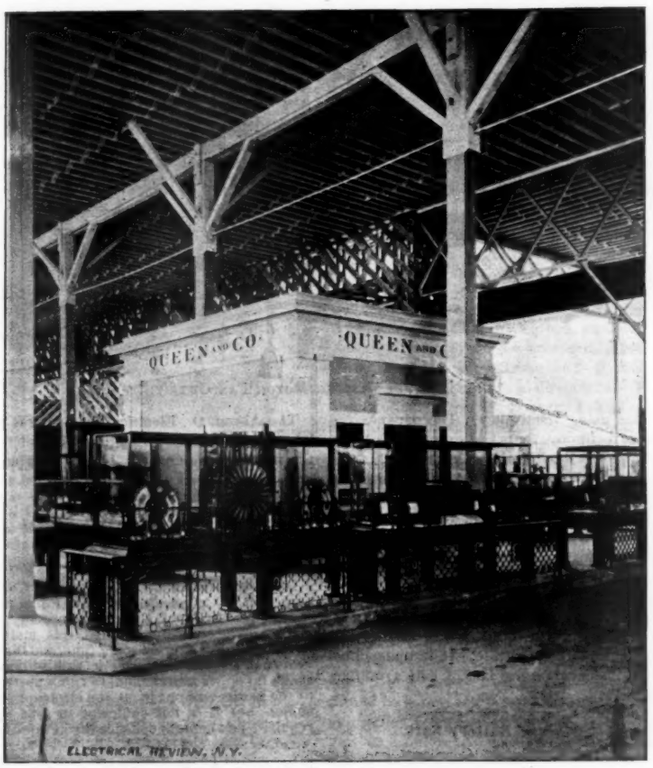
Professor Cross, of the Massachusetts Institute of Technology, asked one of his electrical engineering students to explain how a current flows through a wire. The answer is said to have been this: "A current flows in a wire in circles outside of it."

An explosion of a storage battery cell in New York occurred recently under peculiar circumstances. Seven Julien cells, in process of being charged with a 10 ampere current at 110 volts, were disconnected while in circuit, in order to put in another cell. At the instant the connection was broken there was a vivid flash, followed by a loud explosion. The middle cell was completely wrecked, and several persons standing near were thrown back and covered with acid. The explosion was due to the spark caused by breaking the circuit igniting the uncombined hydrogen and oxygen gases in the cell.

Exhibit of Queen & Company, of Philadelphia, at the World's Fair.

The instruments made by this firm now exhibited at the World's Fair are especially commendable from their adaptability to the needs of American engineers and scientists, while in neatness of design, nicety of mechanical detail and exquisiteness of finish they are unexcelled.

The exhibit covers a space of over 16,100 square feet on the ground floor, at the north end of the Electricity Building, Section E. In the center rises a beautiful small pavilion designed by Prof. W. C. Laird, of the School of Architecture, University of Pennsylvania. This pavilion contains the office and a dark room, in which will be shown an electric light photometer, alternate current projection lantern, Crookes & Geisler tubes, all in operation. An opportunity of comparing the new Lummer-Brodhun photometer sight box with the old grease spot form is presented to all interested.



QUEEN & COMPANY'S EXHIBIT AT THE WORLD'S FAIR.

On the back wall of the office is a large switchboard containing the various commercial measuring instruments manufactured by this company. Here can be seen Cardew voltmeters, the magnetic vane ammeters and voltmeters, and a new form of hot wire instrument for alternating and direct currents. On the adjoining wall is a smaller switchboard, containing the commercial instruments designed by Sir William Thomson, whose exhibit is by request in charge of Queen & Company.

Here are shown two multi-cellular voltmeters, reading from 60 to 120 volts, and ampere gauges 0–400 and 0–6,000 amperes.

In the office is also an electrical reference library, with the leading technical journals on file for the convenience of visitors.

Immediately in front of the pavilion, on either side of the entrance, are two cases containing a fine collection of resistance standards. Besides resistance boxes of various ranges, there are Wheatstone bridge sets, complete testing sets, standard ohms, etc. Any of these deserve extended mention, but chief of all, perhaps, the great bridge designed by Prof. Anthony. The arrangement is such that any one coil can be measured separately by any desired method, and any number of each row can be put in series or in multiple, which allows complete checking of the accuracy of the bridge without the use of another of equal precision. The bridge arms are reversible by a commutator, and a temperature coil is used instead of a thermometer.

Hardly less striking is the 100,000 ohm box, composed of ten coils of 10,000 ohms each. The arrangement is such that one can obtain resistances 1,000, 2,000, 3,000, 25,000, and from 25,000 up to 100,000, by steps of five or ten thousand.

A very striking modification has been made in the design of standard coils. The ordinary form of terminals has been retained, and that is about all. The standard coil proper is wound upon and insulated from a metallic cylindrical casing perforated with holes. On a similar casing inside is wound a temperature coil provided with proper terminals. This temperature coil is a copper coil, whose resistance at 0° and temperature coefficient have been very accurately determined. Then by measuring the resistance at any time the temperature may be accurately calculated. The temperature coil gives the average temperature of all the convolutions of the standard coil much more accurately than would a thermometer, and its use is much to be preferred for work of extreme precision. The two coils above described are immersed in a specially prepared oil which does not act on the coils in any way. Surrounding this oil bath is a third coil to be attached to a battery and an adjustable resistance. This arrangement is for maintaining the temperature of the standard coil at any desired point and is vastly superior to the old lamp and water bath. In the construction of the resistance boxes and standards the utmost care in manufacture and testing is observed. At the laboratory each spool of wire has its temperature coefficient measured, and only those having the same coefficient are put in the same box.

The next case on the left contains instruments for alternate current measurement. In addition to hot wire instruments and Siemens dynamometer for amperes and watts, there is an improved Mascart electrometer and several electrometers designed to be used according to the method devised by Prof. Harris J. Ryan, of Cornell University.

The next case is filled with induction coils from small to great, and another case contains Crookes, Geissler and spectrum tubes, which will be shown in operation.

One large case is devoted exclusively to galvanometers, which present many important points of design. The most unique is the Moler swinging arm tangent, a sort of combination of the Thomson graded and the Obach cosine, and which has an enormous range. Different patterns of the Thomson mirror galvanometer and a large and exceedingly sensitive dead-beat reflecting galvanometer, compel admiration, not only on account of their electrical design, but from the ingenious yet simple manner in which the features of interchangeability of coils and possibility of connecting them, series, multiple or differentially, is secured. The Ballistic galvanometer, with the method of magnetic control, without drift, is a fine product of scientific design. In the next case are shown commercial instruments, such as the carbon rheostat, the portable testing set, the cable testing set, etc. Another case is devoted to telescopes, scales and lamp stands and scales.

Another contains apparatus for the exact comparison of resistances; comprising a new cylinder bridge, a meter bridge, of unique design, a bridge for measuring conductivity and several Carey-Foster commutators. On the other end of the space is a case containing static machines, and two cases containing apparatus of Sir Wm. Thomson. Of these the most striking are the large watt-meter and the electrostatic balance measuring to 50,000 volts.

Two cases of measuring instruments for student use present some very valuable designs hardly excelled by the instruments of precision. Two enormous Hertz mirrors similar to those supplied by the University of Missouri are sure to attract a great deal of attention, since these are the only two pairs in the country.

The entire space is surrounded by a handsome wrought iron railing, of Venetian motive, also designed by Professor Laird.

In addition to this exhibit, Queen & Company have six others in the Manufactures and Liberal Arts Buildings, all of which are under the charge of Mr. Clayton W. Pike, B. S. Those of their Exposition staff attached to the electrical exhibit are Mr. Edw. R. Keller, M. E., and Mr. Edw. F. Northrup, A. B.

An entire volume would be none to large to satisfactorily describe in detail the apparatus on exhibition, and no electrical engineer should fail to allot a large portion of his time at the Exposition to the careful study of this exhibit.

LITERARY.

"Transactions of the American Institute of Electrical Engineers" for May, 1893, has been received.

The May number of *World's Fair Electrical Engineering* is an issue very creditable to Editor De Land. Articles substantiating its title are plentiful and good, besides which is published a very thorough synoptical index of current electrical literature.

"The Mineral Industry, its Statistics, Technology and Trade for 1892," edited by R. P. Rothwell, editor of the *Engineering and Mining Journal*. Published by the Scientific Publishing Company, 27 Park Place, New York. Price, $2 in paper cover; $2 50 in cloth. The volume constitutes the "annual statistical number of the *Engineering and Mining Journal*," and gives the statistics to the end of 1892, or, information just a year later than the volume of the United States Geological Survey, just issued. It is a marvel of statistical compilation and is invaluable as a reference book. The mining industry in the United States and other countries is fully covered from the earliest times to the close of 1892.

An Eagle Struck by Lightning.

A singular occurrence is stated by the Walton, N. Y., *Reporter* as having happened near Houck Hill in Delaware County. The electric storm of Friday night, April 21, was quite severe, and several very sharp flashes of lightning, accompanied by terrific peals of thunder, seemed to convulse the heavens. The inmates of the snug farm house of Henry Houck thought it a pretty hard storm, but did not know that lightning had struck in that vicinity until, on going out in the morning, Mr. Houck discovered a large baldheaded eagle lying in the yard where it had fallen, dead. On examination it was found to have a streak running from tip to tip on its wings and across its breast, where the feathers had been burned off and the flesh was scarred as with a hot iron. It was undoubtedly struck by lightning. The bird measured, from tip to tip, a little over five feet.

A Big Trolley Suit.

A suit for infringement and damages has been brought against the Winchester Avenue and West Haven Electric road, at New Haven, Conn., and the Westinghouse Parent Corporation, in Pittsburgh and New York. The suit is one to restrain these concerns from using the trolley. The papers were drawn up by Betts, Atterbury, Hyde & Betts, of New York, as attorneys for the Thomson-Houston Electric Company, at whose instance the suit is brought.

A prominent official of the New Haven concern, a gentleman who is well informed on electrical patents issued during the past half century, makes the statement that the trolley was used nearly twenty-five years ago in telegraphing from moving railway trains, and the plaintiffs in this case are prepared so to demonstrate. It is understood that the damages are laid at half a million dollars.

Storage Battery Suit.

The Brush Electric Company and the Consolidated Electric Storage Company, as the owners of the patent upon the storage battery, granted C. F. Brush, March 2, 1886, are the plaintiffs in a suit for an injunction against the Milford and Hopedale Street Railway Company, Hopedale Electric Company, William S. Hall and Edward P. Usher, of Boston, to restrain them from alleged infringement. The defendants have in use a storage battery invented by Edward P. Usher, who is also a defendant. The case was begun last week before Justice Colt in the United States Circuit Court at Boston on an application by the plaintiffs for a preliminary injunction. The defendants deny any infringement upon the Brush patent. Usher's patent was granted in 1892.

ELECTRIC LIGHT FLASHES.

The Youngstown, O., Electric Light Company, the Mahoning Electric Light Company and the Youngstown Gas Company will soon be incorporated as one concern. The management will also be materially changed and the different plants will be placed under the same management.

The Hathaway and Bristol mills, of New Bedford, Mass., have contracted with the Mather Electric Company, of Manchester, Conn., for individual electric plants to light their new mills. The former will put in two 600 light machines, and the latter two 500 and one 100 lighters.

The city council of Marshfield, Wis., has entered into a contract with the Marshfield Water, Electric Light and Power Company for lighting the city for five years at the annual rental of $1,800 per year. The contract calls for 23 arc lights of 2,000 candle-power each, to burn from early twilight until midnight.

It is probable the plan of establishing a gigantic electric plant for furnishing light, heat and motive power for several towns in the vicinity of Glens Falls, N. Y., will be effected. The plan of the capitalists who have the scheme in hand is to dam the Hudson about eight miles above Glens Falls. An expenditure of $500,000 will be necessary.

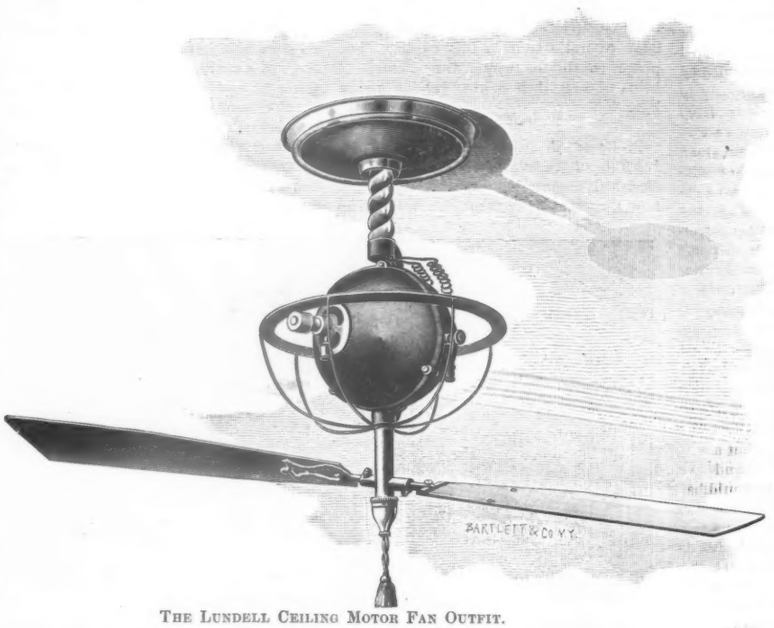
The Akron, O., Electrical Company is to be congratulated on having just completed the filling of one of the largest contracts ever before given to it. It furnished the lights, 34,000 incandescents, for the new Pendleton Hotel at Chicago. This is one of the swell hotels of the city, being the one at which President Cleveland will be a guest during his visit at the Fair.

It is rumored that S. D. Warren & Company will put in an electric power plant at the Lower Falls of the Presumpscot in Maine. The company has had this matter under consideration for some time, and three years ago built a building for this purpose at the falls. A power plant to run a portion of the works was put in at the electric light station, but it is not sufficient to give the requisite power needed, hence the new move.

Judgments in Favor of Major John B. Powell.

Two judgments, one of $70,000 and another of $20,000, were recently entered against Mr. Thomas J. Montgomery in favor of Major John B. Powell. These judgments were in notes given by Mr. Montgomery for stock in the Hydraulic Brake Company, a company owning some important brake patents, which gives to each car an individual automatic brake independent of the other cars.

Both Mr. Montgomery and Major Powell are well known in electrical circles, the former, in the early days of electric lighting, realizing a handsome fortune out of the sale of the Brush patents in Europe and the latter was for several years general manager of the Brush-Swan Company, of New England.



THE LUNDELL CEILING MOTOR FAN OUTFIT.

The Lundell Ceiling Fan Motor Outfit.

We illustrate on this page an ingenious combination of a big two blade fan and a small, compact motor. The device is so constructed as to depend from any ceiling at the correct distance for the required effect, whether a heavy blast, a light, gentle breeze, or any gradation between the two extremes is wanted. The blades of the fan are constructed of hard wood, and the pitch of them can be changed to suit requirements by loosening the screws which hold them in position and resetting them.

The method of transforming the motion of the commutator shaft of the motor into a motion at right angles to it is worked out so cleverly as to obtain an absolutely noiseless result at maximum speed. Upon one end of the motor shaft a small friction wheel is attached. Encircling the motor and resting on this wheel is a thin circular ring plate, which receives its motion by friction from the small wheel. This circular ring plate is in turn connected with the fan shaft by four curved metal braces, making a solid and strong construction.

The relation of the speed of the fan to that of the motor thus becomes as one to eight. To operate this outfit only six-tenths of an ampere of current is required, or about the same amount as is required for an ordinary 16 candle-power lamp. The economy in working this outfit, therefore, is readily appreciated. The motor is the invention of Robert Lundell and the outfit is placed on the market by the Interior Conduit and Insulation Company, of this city.

FINANCIAL.

The Electric Light and Power Company of Abington and Rockland, Mass., has declared a dividend of $6 per share.

The Fort Wayne Electric Company has declared a semi-annual dividend of 50 cents per share, payable May 15 to stockholders of record May 12. The net earnings for six months to March 1, 1893, were $166,386, leaving a balance in excess of 100 per cent. of the amount necessary to pay dividend to be carried to surplus account.

Stockholders of the Philadelphia Traction Company have filed a petition for information, asking what the company has done with $9,000,000 of proceeds from sale of stock and bonds since incorporation. The company has declared a dividend of $1.50 per share, payable May 31. Books closed May 16 until May 31.

Some large Boston capitalists, not identified with the General Electric Company, have recently looked into its affairs for their personal information, and their investigations satisfied them that the company was all right, says the *Boston News Bureau*. They did not, however, believe that the company should hold so many local electric lighting stocks that might be sold at a considerable premium. They concluded that the General Electric Company should have no debt at all, as the borrowing ability of a single company like the General Electric is less than the aggregate borrowing ability of the two old companies, Thomson-Houston and Edison. This is true of all industrial and corporate enterprises, and is the source of much distrust to-day, for while a cotton mill with $1,000,000 capital can borrow $1,000,000 at any time for an overturn of goods, a cotton mill with $10,000,000 capital could not borrow $5,000,000 for the same purpose. As a matter of fact, the General Electric Company has twice as much cash on hand as it has of obligations maturing the next 60 days. Of the stocks and bonds now held by the General Electric Company, contrary to the general impression, a very large percentage has been received by the company in settlement of territorial rights and not in payment for apparatus. The company has reduced the amount of such stock and bonds largely during the past six months.

Wall Street and the Electrical Stock Market.

The Wall street market during the past week has been of a nature prophesied in my last report. It presented the aspect of a man who had received very much the worst of a prize fight. The liquidation which started on Monday continued through the week; in addition a very large block of long stock held by weak holders changed hands. The bears have been very active putting out a large line and there is no doubt but what the market is largely oversold. This is indicated by the rates at which various stocks are loaning, as well as the tendency towards higher values on spasmodic movements to cover. The news of the week has been exceedingly depressing. The government crop report issued on Wednesday made a bad showing of wheat prospects. This was reflected by lower values in railroad securities. The troubles of Western banks and other financial and industrial institutions, as well as recurrence of the Australian bank difficulties, and a number of failures on the London Stock Exchange, have well nigh stamped out what little vitality was left after the street's failures of last week. Various large houses which were suspected of weakness have been fortifying their condition, and it is now believed that they will pull through. Suspicion has been turned from them to certain of the national banks which held Cordage paper, and we have from good authority that an examination of these institutions is to be made. There was some investment buying in the market during the week, stock being bought literally and taken from the street. It is probable that there will be a reaction towards higher values next week, owing to the oversold condition of the market. It will not possess any pronounced permanency, however. There is no immediate promise of a general and broad improvement.

General Electric stock was the most active on the list and was most unmercifully hammered by the bears. Its course was very irregular, fluctuating over the range from 80 to 70, changing as many as 5 and 6 points in a day. The tendency has been downward and the closing was at 72⅝ against an opening of 80½. The causes which have led to this erratic career are manifold. As a primary one might be cited the persistent assertions of the bears that the financial condition of the property is not all that it should be. They have repeatedly hinted at a dearth of operating capital, an incubus of securities of subordinate companies, the necessity for a stock issue, the suspension of dividend, the calling of a loan, a reduction of the dividend and a falling off in the orders which the company is receiving. These various rumors were put in the form of a categorical communication to President C. A. Coffin. His reply denied every rumor, pronounced them as malicious and contained in addition the information that General Electric had unfilled orders for 2,500 railway motors and 127 railway generators; that the income from this source would be $3,000,000, of which 75 per cent. will be in cash and the balance in well secured notes. This very emphatic statement carried due weight, and on Thursday the stock rallied from 70½ to 76. On Friday and to-day it sagged off as stated. One theory as to the cause of the decline is that the extension of the charter of the Niagara Falls Power Company, authorizing it to run currents to every point in the State, will curtail the usefulness of the General Electric Company. I have investigated this matter very thoroughly, and, while finding that the project of conducting power for lighting and motor purposes to New York is believed to be perfectly feasible by electrical experts, that the General Electric, Westinghouse and other companies will be benefited thereby. At the time electric light was introduced in New York, it was thought that the gas companies would be forced out of business. Instead, the earnings of the latter corporation have been larger than ever before. When the Brooklyn Bridge was built it was believed that the ferry companies would be forced to suspend operations. As is well known, they are doing a larger business than ever. The facts being that increased facilities created a corresponding increase in the demand. This would naturally be the case with the General Electric Company, providing the Niagara power plant extends its operations as is proposed. The demand for electricity for power and lighting purposes will be very greatly increased because of a cheapening. This will afford an enlarged market for motors and other equipment. It is believed that it will be many years before a power company of this kind can successfully compete in large cities with established plants, owing to the completeness of equipment, franchises, customers, etc.

Certain very conservative elements in the Street continue notwithstanding the statements of the officers, to be very bearish on the property. Judging from the sentiment the downward movement is not over, and will not stop until the stock receives very substantial support from insiders.

The bonds of the company sold in quite large amounts down as low as 89. The average was 90½.

The Western Union participated in the general soggy market. It was argued by sellers of the stock that the general business depression of the company, which is commencing to be very pronounced, will be immediately reflected in Western Union earnings. An institution of the enormity of Western Union, which reaches every hamlet, cannot otherwise than feel a financial stringency. The opening price on Monday was 85¾ and the close to-day 82¼.

Edison Electric Illuminating, of New York, which may be regarded as a fair type of a better class of illuminating companies, held its own remarkably well around 114. The stock is mostly held for investment purposes, and orders to buy or sell at the market advance or depress quotation from one to two points. In other words, there is very little market for the stock. We are informed that the earnings of the company continue to make a gratifying increase.

Of inactive electrical stocks very little can be said, aside from the fact that there was little demand and no pressure to sell. This will probably be the case with these securities until we get a good bull market.

ACTIVE STOCKS.

The following table gives the gauge for the week of the active stock and the closing bid and asked price on Saturday :

	H'g'st.	L'w'st.	Bid.	Asked.
Western Union.....	87	81¾	82	82¼
General Electric.....	81¾	70⅛	73⅛	73⅜
Edison El. Ill., N. Y...	115	111¾	114	115
American District Tel.	56	53	53	....
American Tel. & Cable	85	83	....	....
North American.....	9⅛	8	8	8⅛

New York, May 13.

The Striking Linemen.

President Watson, of Local 31, of the National Brotherhood of Electrical Workers said last Saturday that nearly all of the striking telephone linemen in Jersey City and Hoboken had found work with other companies. He says that the New York and New Jersey Telephone Company is crippled by the strike, but Superintendent McCully of the company emphatically denies this, and says he can get all the men he wants.

Last Saturday at 12 o'clock the Citizens' Illuminating Company, of Brooklyn, came to a verbal understanding with the Brotherhood by which five of its ten striking linemen were to be taken back, the company agreeing that in the future only union men would be employed and union wages would be paid. At three o'clock the same day the company was asked to sign a written agreement which it refused to do. The whole matter was then thrown up, and on Monday morning no settlement had been reached. The Citizens' Company declared that it would have nothing further to do with the Brotherhood.

And yet another new incandescent lamp is announced. This fact serves as one more illustration of the wonderful fertility of invention which has many times been witnessed in the electrical field. A necessity need but be expressed when answering results are produced by our able inventors.

Death of Sir James Anderson, Commander of the "Great Eastern" on Her Famous Cable-Laying Expeditions.

Sir James Anderson, J. P., F. R. G. S., F. G. S., F. S. S., who shared the honor of laying the first Atlantic cable with Cyrus W. Field, died at his residence, Queen's Gate, London, on May 7, in the sixty-ninth year of his age. He was born at Dumfries, Scotland, in 1824, and joined the merchant marine at the age of 16, making several voyages to India and the west coast of America. He entered the service of the Cunard Steamship Company in 1851, and was selected by the Transatlantic Telegraph Company to command the "Great Eastern," the largest steamship ever built, in the cable expedition of 1865. The cable was lost in midocean, but such experience was gained that, under his command, the cable of 1866 was successfully laid and that of 1865 picked up from a depth of two miles and completed. For the part he took in this work he received the honor of knighthood.

Sir James Anderson's connection with transatlantic telegraphy has been productive of most important results, as he was one of the first authorities on cable matters. At the time of his death he was chairman of the Brazilian Submarine and Direct Spanish Telegraph Companies; managing director of the Eastern, the Eastern and South African, and the West African Telegraph Companies; a director in the Anglo-American Telegraph,

SIR JAMES ANDERSON.

the African Direct, the Eastern Extension, Australasia and China Telegraph, the Globe Telegraph and Trust, the Submarine Cable Trust, and the West India and Panama Telegraph Companies; a director of the Metropolitan Electric Supply Company, Limited, of London; and a trustee of the Submarine Cables Trust.

Sir James was a member of the Statistical Society, before whom he read a paper on "Statistics of Telegraphy," which afterward appeared in book form and became an authority. He also wrote papers on "Cables in Time of War," "The Government Purchase of Submarine Cables and Reduction of Telegraph Rates," "The Telegraphic Communication of the Empire and a Comparison of the Various Routes to the East." He advocated an "Authorized Vocabulary" from which words used in code messages should be taken, and it was due principally to his efforts that the last International Telegraphic Conference decided to compile an official list of words to be used in codifying telegrams.

A memorial service was held over Sir James Anderson's body at St. Philip's Church, Earl's Court, London, on May 9. Among those present, besides the chief mourners, were Sir John Pender and the Marquis of Tweeddale, representing the Associate Telegraph Companies, and many other telegraph notabilities. A piece of the original 1866 cable was attached to Sir James Anderson's coffin. The remains were taken to Dumfries, his birthplace, where they were interred with impressive ceremonies.

Dr. Henry M. Field, in his admirable book, "The Story of the Atlantic Telegraph," pays the following tribute to Sir James Anderson :

"Next to the good fortune of finding such a ship ready to their hands was that of finding an officer worthy to command her. Captain James Anderson, of the "China," one of the Cunard steamers, had long been known to the traveling public, both of England and America, and no one ever crossed the sea with him without the strongest feeling of respect for his manly and seamanly qualities. A thorough master of his profession, having followed the sea for a quarter of a century, he was also a man of much general intelligence and of no small scientific attainments. But it was something more than this which inspired such confidence; it was his ceaseless watchfulness. He always carried with him a feeling of religious responsibility for the lives of all on board and for every interest committed to him. A man of few words, modest in manner, he was yet clear in judgment and prompt in action. This vigilance was especially marked in moments of danger. When a storm was gathering, all who saw that tall figure on the wheel-house, watching with a keen eye every spar in the ship and every cloud in the horizon, felt a new security from being under his care. Such was the man to be put in charge of a great expedition. He was recommended by Mr. Field in the strongest terms, and was chosen unanimously by the board. The Cunard Company, with great generosity, consented to give up his services, valuable as they were, to forward an enterprise of such public interest. Being thus free, he accepted the trust, and entered upon it with enthusiasm."

Nearly a year and a half after this, when the cable was safely landed in Newfoundland, Captain Anderson, still on board the "Great Eastern," in a letter to a friend, thus referred to his first connection with the Atlantic telegraph :

"I cannot tell you how I have felt since our success. It is only seventeen months since I first walked up to the top of the paddle box of this ship at Sheerness, upon a dark, rainy night, reviewed my past career in my mind, and tried to look into the future to see what I had undertaken, and realize, if possible, what this new step would develop. I cannot say I believed much in cables—I rather think I did not—but I did believe Mr. Field was an earnest man, of great force of character, and working under a strong conviction that what he was attempting was thoroughly practicable; and I knew enough of the names with which he had associated himself in the enterprise to feel that it was a real, true, honest effort, worthy of all the energy and application of one's manhood; and come what might in the future, I resolved to do my very utmost, and to do nothing else until it was over. More completely, however, than my resolve foreshadowed, I dropped inch by inch, or step by step, into the work, until I had no mind, no soul, no sleep that was not tinged with cable. In a word, I accuse Mr. Field of having dragged me into a vortex that I could not get out of, and did not wish to try—and the sum total of all this is to lay a thread across an ocean! Dr. Russell compared it to an elephant stretching a cobweb, and there lay its very danger: the more you multiply the mechanism, the more you increase the risk."

Through the kindness of Dr. Henry M. Field, the ELECTRICAL REVIEW is able to present herewith a portrait of Sir James Anderson, which is said to be an excellent likeness. Dr. Field has just returned from London, where, about three weeks ago, he dined with Sir James Anderson, who was then in his usual good health.

The Trolley Litigation.

An action has been begun by the Thomson-Houston Company against the Winchester Avenue and West Haven Electric Road, of New Haven, and the Westinghouse Electric Company, Pittsburgh, for alleged infringement of the overhead trolley patents. A representative of the ELECTRICAL REVIEW, in an interview with Betts, Atterbury, Hyde and Betts, learns that this action is the beginning of another series of litigation between the two great electric companies. The grounds on which it is brought are the Van Depoele patents on the overhead trolley system. These were not issued until April, and the attorneys inform us that this action was filed at the earliest possible moment; that it is not a game of "bluff" in any sense of the word, as has been construed by certain of the press, but that it involves the rights to use the trolley and that it will be fought to the bitter end.

The action asks for $500,000 damages, and a preliminary injunction pending a hearing for a permanent injunction. It will probably be a month before an answer will be filed by the Westinghouse Company, and a good many months before it passes through the United States Court of Appeals, to which it will undoubtedly be brought.

The attorneys expressed themselves as confident of success, and claim that the outcome will result in a complete prohibition to Westinghouse for manufacturing the trolley, and also will prevent existing lines using the goods of Westinghouse manufacture without paying a royalty to the Thomson-Houston Company. Moreover, damages for apparatus now in use will be asked for.

Utilizing Electric Motors for Operating Machinery.

An important patent relating to the operation of machinery by electric motors has just been issued from the United States Patent Office to Carl Hoffmann and Ernst Richter, of Berlin, Germany, assignors to Siemens & Halske, of the same place. The invention set forth in this patent will doubtless receive wide application, and, in fact, most of the machinery in the factories of Siemens & Halske, at Berlin, Charlottenburg and Chicago is already operated on this principle. At Charlottenburg this patent has proved of great value, and in these large works there is not a foot of shafting in service. Several other patents will shortly issue showing other applications of this principle and a modified principle.

The object of this invention is to economically and advantageously utilize electric motors for operating other machines. In order to get the best operative results from an electric motor it is essential that it be run at a practically uniform speed. The inventors sustain the motor in movable relation to the machine driven by it, and utilize the weight of the motor in transmitting power to the machine by means of flexible appliances which may be modified by bodily movement of the motor.

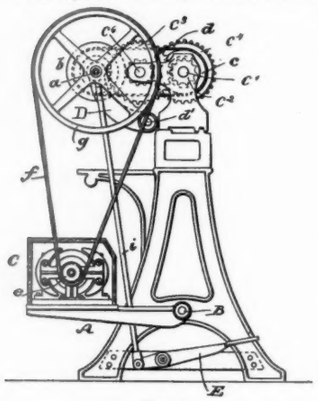


FIG. 1.

Fig. 1 is a side view of a power machine having a driving motor combined therewith, in accordance with improvements. Fig. 2 is a front view; Fig. 3, a plan view of the apparatus illustrated in Fig. 1. Fig. 4 is a side elevation of a power machine combined with a motor and showing a modification. Fig. 5 is a front elevation of the apparatus shown in Fig. 4; and Fig. 6 is a diagram illustrating the movable relation of the motor and transmitting gearing with respect to the power machine.

A platform A is pivotally supported at one end by a shaft B, secured in the lower portion of the frame of the power machine, or otherwise suitably supported, so that its outer end may be freely movable in an upward or downward direction. Upon this platform is mounted a small electric motor C for driving the power machine. A bracket or frame D is pivotally connected at d^1 to the power machine adjacent to its bed, and carries in its upper free portion a shaft a, upon which is mounted a band wheel g and a graduated or cone pulley b. The power of the motor C is transmitted through

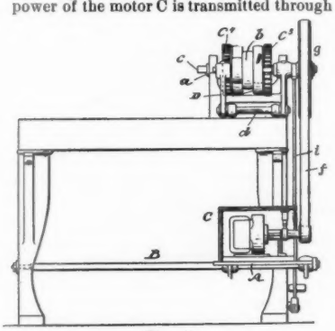


FIG. 2.

the pulley e upon its armature shaft by the belt f to the band wheel g, and thence through the belt d to the graduated or cone pulley c, mounted on the shaft c^1 of the power machine. On the shaft c^1 are also the gears c^2 and c^4, which, respectively, mesh with the corresponding gears c^3 and c^5, mounted on the shaft c^6. A lever E is pivoted on one of the lower cross-bars of the machine frame, and is provided at one end with a treadle plate, while its forward end is attached to the frame D by means of a rod i.

With the parts constructed and arranged as described, the frictional relation of the transmitting gearing will be normally positively maintained, since in the first instance the tension of the belt d is preserved by the

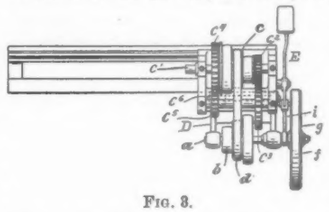


FIG. 3.

weight of the frame D, and the parts carried thereby plus the suspended weight of the motor, exerted through the belt f. It will be readily understood that such conditions serve to effect the communication of the full speed of the motor to the power machine.

Now, should it be desired to modify or interrupt the speed of the power machine, to permit the belt d to be shifted, or for any other object, the treadle end of the lever is depressed by the foot of the attendant, so that the frame D and suspended motor are elevated to relieve the tension of belt d, thereby modifying the transmitted speed in proportion to the degree of elevation of the frame D. It will, therefore, be understood that such an operation is highly advantageous, since, as before generally explained, the desired modification of the speed of the power machine can be effected without in any way varying or affecting the speed of the motor.

The normal tension of the belt d is best illustrated by the diagram, Fig. 6, wherein line 1 refers to the belt, line 2, the frame D, and lines 3 and 4, the compound tension force exerted by the suspended motor on the belt d.

In Figs. 4 and 5 there is shown a construction modified to adapt the improve-

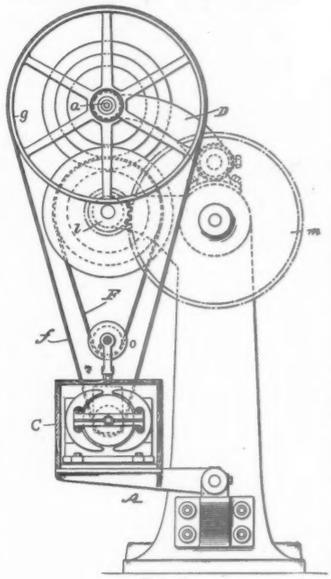


FIG. 4.

ments for use in connection with arrangements wherein the power machine is driven by means of frictional contact pulleys. The frame D is pivoted at its inner end and carries the graduated friction pulleys b in fractional relation with a set of corresponding pulleys j, turning with a counter shaft k the end gear pinion l of which permanently engages the driven gear wheel m of the power machine.

The frictional engagement of the pulleys b and j is normally maintained by the weight of the motor acting through the belt f on the band wheel g on the end of shaft a, to which motion is communicated by said belt. The relatively reversed graduated pulleys b, j are of equal dimensions, so that they would, in the absence of special provision to the contrary, bear a fixed relation to each other. In order, however, to permit the frictional engagement of any one of the driving pulleys b with the opposite driven pulley j, and maintain the other pulleys out of operative contact, a belt or band F is employed, which passes over one of the pulleys j and is given the desired tension by means of a weight n, carrying a pulley o hung on said belt.

The thickness of belt interposed between any one of the pulleys b and opposite pulley j will be sufficient to insure the communication of movement from the former to the latter while the other pulleys are out of engagement. By slightly elevating the frame D, the belt F can be readily shifted from one pulley j to another, and thereby vary the degree of transmitted speed without modifying the action of the motor.

The weight n suspended by the pulley o enables the belt F to have a travel corresponding with the frictional motion transmitted, so that the belt will not bind nor offer any objectionable resistance to the frictional transmission. This last described modified construction shown in Figs. 4 and 5, is not essentially different in some features from the other construction shown in Figs. 1, 2 and 3 of the drawings, as in both constructions the machine to be operated has a pivoted frame carrying gearing which transmits to the operative shaft or part of the machine the power derived through the belt f from the electric motor. The con-

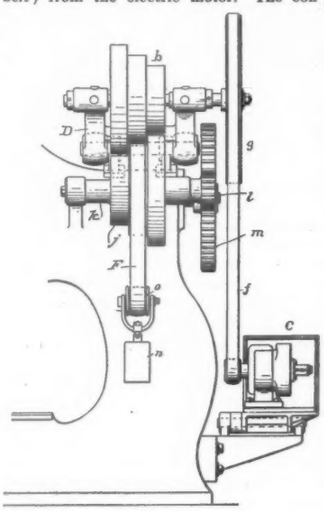


FIG. 5.

struction shown in Figs. 4 and 5, however, provide for transmission of the power by utilizing the weight of the electric motor through the belt f, the pivoted frame D, and the cone pulley b upon the counter-weighted belt F, in frictional contact with one of the pulleys of the lower cone pulley j which is geared at l, m, to the operative part or shaft of the machine to be driven, and change of speed of the machine is provided for by simply shifting the counterweighted belt F laterally between the opposing cone pulleys b, j, of the machine, instead of being effected by means of the treadle and rod connection E, i, as in the first described construction shown in Figs. 1, 2 and 3 of the drawings. In the construction shown in Figs 1 and 2 of the drawings, the driving belt f remains taut between the motor pulley e and the machine pulley g, during the lifting of the pivoted frame D, by the treadle connections E, i, and the consequent yielding or slackening of the belt d, which slips more or less on the cone pulleys to vary the speed of the operative spindle or part of the machine, and to an extent depending upon the range of depression of the treadle lever by the attendant. The claims of the patent, which are quite broad, are given in full below:

1. The combination with a power machine, of an electric motor and frictional transmission gear, the motor being movable in its relation to the power machine to modify the transmission gear and thereby vary the speed of the power machine without varying the speed of the electric motor.

2. The combination with a power machine, of a suspended electric motor and frictional transmission gear held in operative relation by the weight of the motor, the movable capability of the latter serving to permit the variation of the transmission gear and thereby the speed of the power machine without varying the speed of the electric motor.

3. The combination with a power machine, of a movable frame carrying transmission gearing for driving the power machine, and a pivotally supported electric motor suspended by its driving belt from the frame gearing, substantially as described.

4. The combination with a power machine, of a movable frame carrying transmission gearing for the power machine, a movable electric motor suspended by its driving belt from the frame gearing, and a foot lever and connection for vertically moving the frame to modify the relation of the transmission gearing, substantially as described.

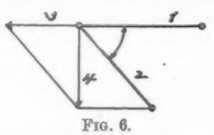


FIG. 6.

5. The combination with a power machine, of a movable frame carrying transmission gearing imparting motion to the power machine by a belt, and an electric motor geared with the transmission gearing by a belt, said motor being movable in its relation to the power machine to release or slack the belt between the latter and the transmission gearing and still maintain the motor belt taut, substantially as described.

6. The combination with a power machine, of an electric motor, interposed mechanism for transmitting the power of the motor to the power machine, and means, substantially as described, for varying the energy transmitted without varying the speed of the motor.

7. The combination with a power machine of an electric motor, interposed mechanism for transmitting the power of the motor to the power machine, and means for varying the energy transmitted without varying the speed of the motor, which means consists of mechanism which acts to modify the effective weight of the motor and thereby effect alterations in the speed of the power machine.

8. The combination with a power machine of an electric motor, interposed flexible mechanism for transmitting the power of the motor to the power machine, and means for varying the power transmitted without varying the speed of the motor, by varying the tension exerted by the weight of the motor upon the flexible transmitting mechanism.

9. The combination with a power machine of a pivoted platform, an electric motor mounted upon said platform, a pivoted frame carrying a band wheel and a graduated or cone pulley, a belt interposed between the band wheel and the electric motor, a belt interposed between the graduated or cone pulley on the pivoted frame and a similar pulley upon the power machine, and a device for varying the tension of said last named belt, to vary the speed of the power machine.

The Opening Scene at the World's Fair.

A representative of the ELECTRICAL REVIEW called on Gen. E. S. Greeley on his return a few days ago from a visit to the World's Fair at Chicago. The General very justly was elated over the success of the opening of the Fair by means of the "Victor" telegraph key owned by his company, the E. S. Greeley & Company, New York city. The entire work of putting up the signaling apparatus, etc., was placed in the hands of his company, and a gold "Victor" key specially made for the event. This key was afterwards enclosed in a glass case, and is now to be seen in the fine exhibit of the company in the Electricity Building.

Gen. Greeley stated that the moment President Cleveland finished his address he turned, and, with hand poised in the air, stood for a second before pressing down on the key. The scene was most impressive. Gen. Greeley, who earned his military title by gallant fighting during the civil war, said that never, even on the eve of a great battle, had he experienced the emotion he did at that moment, when he realized how much depended on the perfect operation of that small piece of metal and the minute electric current which it unloosened. When the President's hand descended, instantly the fountains burst forth, the engines started, the whistles blew, the bells rang, the bands played, the flags were unfurled, and it was to be noticed that all present looked joyful, and congratulations were bestowed in all directions, Gen. Greeley naturally coming in for a large share of them.

The key will undoubtedly be an object of great interest at the World's Fair.

New York Electrical Society.

The annual meeting of the New York Electrical Society was held at Columbia College, May 5. The secretary's report gave the list of members as 309, a net increase of 17 over last year. The following officers were elected for the ensuing year: President, Joseph Wetzler (re-elected); vice-presidents, Prof. F. B. Crocker (re-elected); Nikola Tesla (re-elected); M. M. Davis, C. E. Emery, Dr. W. E. Geyer, W. J. Jenks, C. O. Mailloux; treasurer, Henry A. Sinclair (re-elected); secretary, George H. Guy (re-elected). A lucid and eminently practical lecture was given by Prof. F. B. Crocker on "Dynamotors, or Direct Current Transformers."

A Good Technical College.

The Rose Polytechnic Institute, of Terre Haute, Ind., is one of our leading engineering colleges, and is especially fortunate in its thoroughly modern equipment and plan of instruction. It lays special emphasis on the practical side of technical education, which it is enabled to do throughout the whole course of four years by its ample shops and laboratories and exceptionally complete outfit, especially in electricity.

Removal.

W. R. Ostrander & Company, the well known manufacturers of speaking tube and electric bell supplies, have removed from 195 and 197 Fulton street, New York, to 204 Fulton street, nearly opposite their old location, where they will have a full line of electric house-furnishing goods always in stock.

Electric Lighting of the New Cunarder, "Campania."

The electric installations in the new sister ships of the Cunard line, the "Campania" and "Lucania," have been carried out by Messrs. Siemens Brothers & Company, Limited, London. We are indebted to London *Engineering* for the following particulars of the "Campania's plant and the accompanying illustrations. The electric generating plant is in duplicate, so that in no case can there be an entire collapse, two sets being placed each side of the centre-line watertight bulkhead. There are in each ship about 1,350 lights, and these require an output on the part of the dynamos of 42,000 watts. The current is distributed throughout the ship by about 50 miles of wire, thickly insulated in vulcanized india-rubber, and laid on the return conductor system in connection with Siemens' patent distribution boxes. The brilliancy of the illumination and the ease with which it can be regulated are in marked contrast to the candles and oil lamps of a few years ago. Then, apart altogether from the immunity from accident, there is the lesser room required, and the immense improvement in the atmosphere, due to the absence of products of combustion. The whole lamps in each ship would give a light equal to about 22,000 candles, absorbing 135 horse-power. In distributing the light the method adopted has been to retain the 16 candle power unit, and to fit lamps in sufficient numbers to give the necessary power, rather than to increase the power of the separate lamps. The former method gives a more equal distribution. In mounting the various lights in the ship, the general principle has been adopted of placing the lamp where it will not be inconvenient, but will afford the most diffused light. Thus nearly all of them are fixed to the roof. Generally speaking, the fittings are of plain, but substantial, design, the builders and owners acting on the experience that such retain their good appearance for a longer time and are more easily kept clean than the highly ornate fittings used in many first-class steamships. The globes are retained in position by a special arrangement which has long been adopted by Messrs. Siemens. On the bracket there is a movable cap, which, by its form and weight, holds the globe in position on the three prongs on which it rests. The whole of the lamp fittings are silver plated.

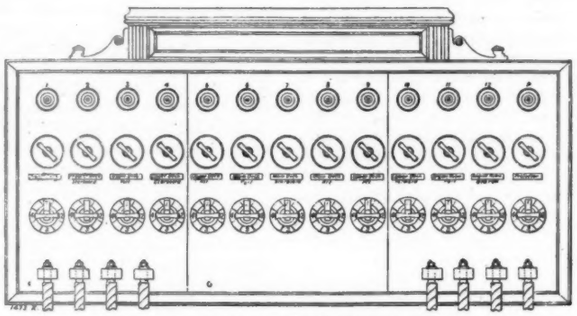


FIG. 2.—THE "CAMPANIA'S" SWITCHBOARD.

All the engine and boiler room fittings, and those for exposed parts, are watertight, the glass globes bedding on rubber rings and being held in position by metal straps. There are several portable lights, provided with flexible wires. In the engine room oil has been a cause of trouble in the destruction of the india rubber insulation of the wires, but here the flexible wires for the portable lamps in the machinery spaces have all been insulated with cotton impregnated with tallow. The reflectors for the hatchways, each with eight 16 candle-power lamps, have flexible wires, and may be hung up in any convenient position. They may, indeed, be used for specially illuminating the promenade deck, should it be desired. It is easy to conceive that on a calm evening the broad expanse of beautifully laid and well kept deck may occasionally become the scene of a brilliantly lighted ball. Under ordinary circumstances the decks will be lighted from an extensive array of lamps, of strong pattern and completely waterproof, arranged along the deckhouses.

The electric current is generated in each ship by four dynamos, each driven by a separate engine, and of one of these engines and dynamos we give an engraving in Fig. 1. All four are similar. Two are placed in the recess in the port engine room bulkhead, formed primarily for the accommodation of the thrust shaft, and two in the same position in the starboard engine room. Any two are equal to running the 1,350 sixteen candle-power lamps in the ship, including the large reflectors of eight lights each for working the cargo, together with the searchlight for facilitating the navigation of the ship into port—picking up the moorings—and for scout purposes should the vessel be engaged as an armed cruiser.

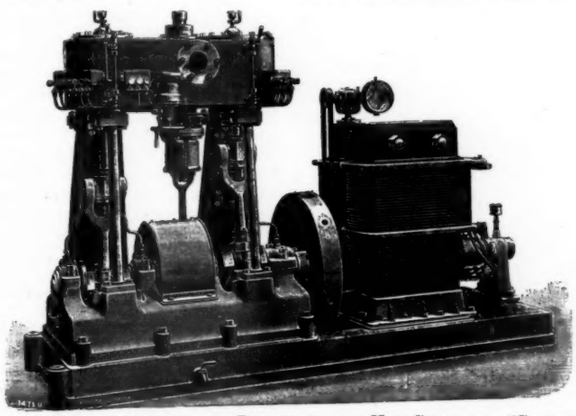


FIG. 1.—A COMBINED ENGINE AND DYNAMO ON THE NEW CUNARDER, "CAMPANIA."

The engines for driving the dynamos are of the open, vertical, compound "Crescent" type, manufactured by Messrs. G. E. Belliss & Company, Birmingham. Each engine is designed for an output of 70 brake horse-power when running at 275 revolutions per minute, and with 100 pound steam pressure at the stop valve. The cylinders are 9½ inches and 15 inches in diameter by 10 inch stroke, and are supported by strong cast iron back standards, which also form the guides for the piston rod cross-head shoe, and from the bedplate in front by two stout steel forged columns. The principal feature in these engines is the patent single slide valve placed centrally between the two cylinders, which does away with a complete set of valve gear, eccentric rods, etc., used in ordinary double cylinder engines. This valve is of the balanced piston type, and admits and exhausts the steam from both cylinders. The governor balls are controlled by springs, and the gear is arranged to operate the single eccentric directly. As there is only one slide valve, the powers in the high pressure and low pressure cylinders are maintained practically equal at all loads, this being unattainable when the governor acts only on the high pressure slide valve. These engines are guaranteed to have a variation of speed between full and no load of not more than two per cent. The cranks are placed opposite each other, and the pistons are equally weighted, thereby making the engine perfectly balanced. The engines have been designed for long continuous running at full power, having specially large bearing surfaces, all pins being case-hardened and working in phosphor-bronze bearings. The lubrication throughout is very thorough, the bearings all being supplied with oil from the three sight-feed oil boxes placed on the cylinder front.

The dynamos are of Siemens' well-known H B type, having drum armatures of 15 inches diameter. Each dynamo is capable of giving an output of 420 amperes under 100 volts pressure at 275 revolutions, and thus can run 700 sixteen candle-power lights. The magnets on the dynamos are supported on brass feet bolted to the engine base-plate. The armature shaft is coupled by an ordinary flange coupling to the shaft of the Belliss engine.

The current from the dynamos is delivered into the principal wires which ascend to the main deck, where the switchboard is situated in a room specially set apart. By the adoption of this means the risk of entire extinction of lights is eliminated, for should one set of generating plant get disabled, another is available, and the inconvenience to the user of the light is momentary. The switchboard consists of a polished white marble slab mounted in teak, and measuring about 7 ft. long by 5 ft. deep. As will be seen from the sketch of it given in Fig. 2, it contains the cut-outs, main switches, and a set of four-way switches so arranged that any main wire can be connected to any dynamo; but no two dynamos can be put on the same main wire at the same time. The dynamo terminals are distinctly separate, and are grouped round each main wire terminal, so that the switch can but connect one of the dynamo terminals to the main. The ammeters, of which there is one to each dynamo, are mounted at the switchboard to enable the attendant to regulate the load on the dynamo; but the voltmeters, which are more useful at the dynamos, will be placed in the engine-room, so that the man at the stop valve can regulate his speed by them. There are 12 mains, which generally pass from the switchboard forward or aft on each deck, and, in addition, there is a supplementary main for the projector (16 in. in diameter), taking a current of 50 amperes.

The wiring is on the return conductor system, and Siemens' patent distributing cut out boxes are in use. The main wires vary from $\frac{19}{14}$—19 wires of 14 standard gauge—to $\frac{7}{18}$. Of the first named 380 yards has a resistance of $\frac{1}{10}$ ohm. The wires have all been tested under water before being fitted into the ship, and the average insulation resistance is about 1,000 megohms per mile. Of the cut-out boxes we give an illustration in Fig. 3. They each consist of a teak case containing a porcelain insulating base, on which is mounted a switch for breaking the circuit and a set of 10 single light cut-outs, arranged five on each side on a vertical bar. Messrs. Siemens' cut-out is slightly different from that ordinarily applied. The plan adopted is to bring the ends of the wire up through the insulating base. The conductor is laid bare for a certain distance, and the fusible bridge is then clamped against the bare portion of the conductor at the one end and in contact with the central bar of the box at the other end. In this way intermediate contacts are dispensed with, and the officer having charge of the key of a particular distributing box may effectually control the lights. The police lights are grouped together, and, while the central part of the distributing box may be entirely disconnected, a special connection is made with the main past the switch, so that the police lights remain in circuit. The return wires are brought to a separate division in the box, whence they are connected to the return main.

In addition to the electric light, Messrs. Siemens have fitted an elaborate installation of electric bells, comprising 13 bell indicators, with an aggregate of 370 transmitters, the power being supplied by Siemens' dry batteries. The motor for the barber shop is driven from the electric light mains.

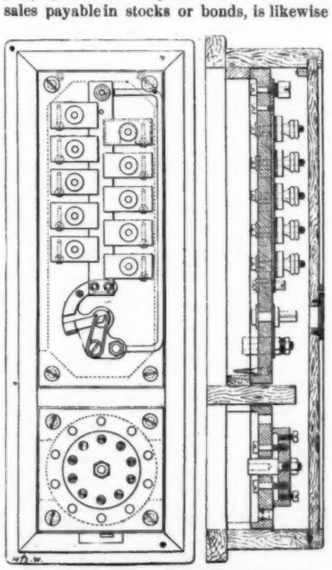


FIG. 3.—CUT OUT BOX USED ON THE "CAMPANIA."

A Request For a Compliment Fulfilled.

I want somebody to say of *Lightning* what the American ELECTRICAL REVIEW (not without justice) says of itself:

The REVIEW is one of the few technical journals which make intricate matters clear, reducing the higher mathematics and verbal ponderosity in which pedants delight, to simple terms, thus bringing applied science within the ken of ordinary mortals. Sprightly, entertaining and newsy, it is well savored, leaves an agreeable taste on the palate, and, like Boggs' Celestial Pills, aids digestion, tones up the system and brings a healthy glow to the cheek.—*London Lightning.*

Our valued friend "Meteor" is in error. The ELECTRICAL REVIEW did not pass the above compliment upon itself. It was the editor of the *Safety Valve* who uttered the remarks and the ELECTRICAL REVIEW was proud to republish them, both as an acknowledgment of the courtesy and to show its readers how an esteemed contemporary thought of it.

Now in regard to "Meteor's" request. If he will substitute the word "*Lightning*," for the word "REVIEW" in the quoted compliment he may consider that the ELECTRICAL REVIEW said it and his request is fulfilled.

A Circular from the General Electric Company.

The General Electric Company, on May 10, sent out the following type-written statement:

"The rumor that this company is going to be reorganized or needs any reorganization is absolutely false. The rumor that it has a heavy and pressing floating debt, or is going to issue, or is contemplating issuing any additional securities, is likewise absolutely false. The statement that the company guarantees any bonds, or has made sales payable in stocks or bonds, is likewise absolutely false. Of the contracts now on its books over 80 per cent. are for cash, and the remainder—less than 20 per cent.—are for well secured notes. The company has been and is in a perfectly sound and easy financial condition, and, both as to its finances and its earning capacity, has never been in as good shape as to-day. Its obligations and those of its underlying companies have been decreased by more than $2,000,000 since the annual statement at the close of the fiscal year."

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Souvenir plates, with the first page of leading New York papers engraved on them, are on sale at the booth of the Women's Press Club at the Press Club Fair, Forty-fourth street and Lexington avenue, New York. Readers of the REVIEW who desire such a souvenir will find there an artistic reproduction of the first page of this journal.

The ELECTRICAL REVIEW congratulates Mr. Franklin L. Pope on the reorganization of his partnership to include Mr. Robt. H. Read, formerly manager of the ELECTRICAL REVIEW Patent Bureau. Mr. Read is a gentleman of rare ability in his profession, and conscientious and thorough in all his work. As we state elsewhere, we consider the partnership one of peculiar technical and professional strength, worthy of the confidence of inventors and scientists in general.

WESTINGHOUSE VS. GENERAL ELECTRIC.

Matters are at a standstill in the latest sensation in electrical circles relating to the alleged theft of blue prints. A preliminary examination has been waived by the defendants, and no warrants can be obtained until the next meeting of the grand jury in Pittsburgh, in June. The Westinghouse people have placed the entire matter in the hands of District Attorney Burleigh, in Pittsburgh. The accused officials in the General Electric Company do not seem to be much affected by the newspaper reports, and they declare that they have received no official notice that they might expect arrest. The entire electrical fraternity has its weather eye upon these two rival companies, and awaits with interest the outcome of the approaching proceedings.

We publish on another page the full annual report of the Board of Directors of the Westinghouse Electric and Manufacturing Company. A careful examination of the figures given for the Board by George Westinghouse, Jr., president of the company, will show some interesting facts concerning the growth and prosperity of this company, arising, in a measure, from the impetus given to the manufacturing departments by the construction of the mammoth electric lighting plant for the World's Fair. The new stopper lamp has proved so successful that new works are projected to meet the constantly increasing demand for it. New buildings are to be erected, and it is predicted that the increased profits arising from the extra facilities will counterbalance the cost of the installation and practically give them the new building free of cost. The substantial available surplus speaks well for the management of the company.

The Moscow correspondent of the London *Chronicle* recently sent this dispatch to his paper:

"It is rumored that the Grand Duke George (second son of the Czar) has become enamored of a pretty Circassian telegraph clerk in the Caucasus, where he is staying for his health. He is determined to marry her. His parents are annoyed, but they will give their sanction, as the Grand Duke is not expected to recover."

We don't know much about the internal domestic economy of Russian royal families, but on general principles we hope the Grand Duke will remain ill until he receives his parents' consent, and then rapidly recover to live a long life of happiness with the woman of his choice. His parents should not be annoyed, as the mere fact of a young woman, Circassian or American, being a successful telegraph operator is conclusive proof of her determination, force and ability to succeed. It would be better for the world if more wives were selected by men in high life from the laboring classes. The reasons are obvious to a thinking man; the subject is so full of meat that we must cease discussion for want of space. But we assure the royal parents that if the Grand Duke's natural manliness and affection have led him to love a Circassian telegraph operator, they would better meet the *fin de siecle* conditions and say, "Bless you, my children."

THE CORRECT VALUE OF THE OHM.

At present many German scientists are discussing the exact value which should be assigned to the ohm. To aid the solution of this very difficult question, Mr. E. Dorn has recently published a paper in which he carefully examines each method that has so far been employed in the determination of the value of the unit of resistance. Each method is fully discussed as to its reliability and its chances for error. The writer also shows that while one part of the necessary final corrections may be applied with mathematical certainty, others are open to a greater or less amount of error.

Without attempting here to give a *resumé* of Mr. Dorn's deductions and reasonings, which are valuable contributions to our present knowledge of the unit of resistance, the student, as well as the practical electrician, will be glad to have a table of the values of the ohm that have experimentally been found since the year 1884 by the various scientists of the world.

The values given below indicate the length of a column of mercury of one mm. diameter at 0° C., whose resistance represents one ohm:

	Lowest Limit.	Highest Limit.	Mean Value.
Wild	.....	.....	1.06192
Duncan; Wilkes, Hutchinson	... ..	.....	1.06352
Mascart, de Nerville, Renoit	.....	.....	1.06288
Kimball	....	.....	1.06250
Kohlrausch	1.06264	1.06310	1.06287
Dorn	.....	.....	1.06235
Rayleigh & Mrs. Sidgwick	1.06255	1.06288	1.06271
Rowland, Kimball, Duncan	.....	.....	1.06290
Rowland, 1887	.....	.....	1.06320
Jones	1.06281	1.06307	1.06294
Glazebrook, Dodds, Sargant	1.07267	1.06299	1.06283
Himstedt	.....	.....	1.06257
Rowland, Kimball	.....	.....	1.06310
Rayleigh	1.06260	1.06312	1.06296
Wuilleumier	1.06267	1.06285	1.06276
Mean value			1.06280

From the above it appears that for all practical purposes 1,063 mm. represents the correct length of the mercury column whose resistance is one ohm.

LETTERS FROM A LABORATORY.—XLV.

BY JULIAN A. MOSES.

The increasing employment of high potential currents has brought into practice the coating of those wires carrying such currents with insulating material of sufficient quality to render the liability of a leakage from simple causes almost impossible. Where, however, the amperage of the current is high, and a large wire is used, this insulation is no less a matter of importance. The cry has been, and will continue to be, for perfect insulation. The introduction of tubular conduits of resisting insulating material has done much to limit the liability of ignition of surrounding materials in case of the conductors being subjected to an unusual degree of heat.

A test of the comparative values of different conduits, insulating materials and other protective coverings for copper conductors was recently held in this city.

The gentleman who had charge of the proceedings had great faith in the quality of his material; so much faith, indeed, that he very thoughtfully put a larger wire in his insulating compound, for (as he explained to the few influential laymen, specially and judiciously invited for the occasion) the purpose of giving a more thorough and severe test to his material. With a few flourishes he turned on the current, and, in short order, the other insulating compounds quietly and respectively curled, melted and burned up, while his material was, as he expressed it, "as cool as a cucumber."

The gentleman in charge smiled a self-satisfied smile; the gentlemen in attendance applauded in an impulsive now-we-know-it-all manner; put their hands deep into their pockets; took them out again and made the inventor happy. A company was formed as a result, and it is now healthily growing under the able and conscientious guidance of the original projector.

But of such insulation and tests little should be said. Quality is that which tells in the end, and the stockholders will next time look out better for their pocketbooks.

The insulating compounds are meriting the success that they are having, for their convenience is obvious; they are filling a growing want, but unfortunately they are all more or less fragile, and, strange to say, it would appear that the predominant disadvantage of the many "best" insulators that are on the market is their inflammability. The introduction of salts, such as sodium phosphate or sodium tungstate, have served the purpose of preventing the cotton, linen, or silk wrappings from bursting out into flame when heated to that temperature which, under ordinary conditions, they would have been, if untreated, rapidly consumed; but the consequent slow burning, or, more properly, smouldering, has left a shell of carbon around the wire which is again but another fruitful source of fire in damp situations. It would, therefore, follow that a material in itself completely incombustible would be the one thing needful. Such materials in a measure, are mica and asbestos. Pressed into solid form, with the admixture of some adhesive medium, a substance is thus produced which withstands a limited raise in temperature, but is practically little better as an insulator than the adhesive medium contained in it, which, in a majority of cases, is a hydrocarbon, and will char or melt nearly as soon as the so-called "non-inflammable tapes."

Surrounding the insulator with a metal sheath has been a great advance, and from its cheapness this method has grown into favor.

Water glass is an incombustible and glutinous chemical, which, upon the application of much heat, changes to an indestructible compound of silicon. It serves as a binder, and, when dry, is an excellent insulator. Shredded asbestos—*i. e.*, asbestos which has been deprived of all lumps and manipulated to a condition resembling mineral wool—can be used as a base, and is convenient when a "perfect home-made insulation" is desired. By wrapping some of the cloth made by patting the asbestos into a thin sheet around a joint, and surrounding this with insulating tape, a covering is obtained which is as resisting as could be desired.

Wires manufactured by several processes are nearly of the same general arrangement, but for impromptu work I have seen this insulation as lasting and as perfect as almost any condition would require.

Unfortunately, shredded asbestos is not as cheap as tar and pitch compounds, but the increased safety arising from its use warrants a trial.

CORRESPONDENCE.

OUR BOSTON LETTER.

The Elektron Manufacturing Company, of Springfield, Mass., are meeting with great success in the introduction of their electric elevators, and, from the universal satisfaction expressed by those who already have them in operation, it would seem that this is destined to develop into an important branch of the electrical industry. Among the contracts recently closed by the Elektron Company for complete outfits in this line, are those with T. K. Horton & Company, of Brooklyn, N. Y.; W. H. King & Son, Springfield, Mass.; Brown, Thompson & Company, Hartford, Conn.; Frank Ferdinand, Boston; Curtis & Bolster, Boston; Jacob Korn, N. Y., and the new Masonic Temple in Springfield, Mass., the finest building in town.

The Bill to allow the Milford and Hopedale Street Railway Company to run their cars equipped with storage batteries on the tracks of the West End Company in this city, came up for final hearing before the Legislature on the 11th inst., and was passed by a vote of 106 to 76. This is a very important victory for the storage battery people, and they feel considerably elated over the large majority in their favor. The suit in which they are the defendants, and which has been brought against them by the Brush Electric Company for alleged infringement on certain improvements in the polarization of secondary batteries, came up before Judge Colt in the United States Circuit Court on the 10th and 11th inst. The evidence, which consisted almost entirely of affidavits, is now under the consideration of the court, and nothing further can be done until his decision is rendered. Should the preliminary injunction asked for by the Brush Company be granted, it would prove disastrous to the further development of the storage battery, but the Milford and Hopedale Company evidently feel full confidence in their ability to maintain the position they have taken, and have pushed their plans through without reference to obstacles in this direction.

The Controversy between the Westinghouse and the General Electric Company in the matter of plans and specifications which the former claim were stolen from their draughting rooms by an agent of the latter, has created an unusual amount of discussion in electrical circles here, and many adherents to both sides of the question are to be found. The great prominence of the contending parties has lent additional interest to the case, and further developments are anxiously awaited. While the Westinghouse and General Electric Companies have always been at swords' points, it has heretofore been an honorable business rivalry, as might naturally be expected between the two largest concerns in their line in the country, each backed by men of undoubted ability and capital for the development and perfection of their various systems. That such a question as the present one should be raised between them is unfortunate, to say the least, as it tends to weaken public confidence, and is bound, whatever the outcome, to be more or less injurious to both parties. Both companies naturally have strong partisans here, and there is no lack of argument as to the rights of the case and its possible outcome, but at the present writing this is entirely a matter of conjecture. In the meantime, it would be well to suspend judgment, and await further developments.

Boston, May 13. H. G. T.

OUR CANADIAN LETTER.

Halifax, N. S.—Tenders will be called immediately for lighting the city by electricity. The contract to be for a term of three years.

Nanaimo, B. C.—The construction of an electric tramway between this place, Northfield and Wellington is talked of. Ex-Mayor Hilburn is promoting the scheme.

Port Arthur, Ont.—Tenders are now being asked for the building of the Port Arthur electric street railway to West Fort William. The road is to be completed and in running order by July 15.

Montreal, Que.—At a meeting of the St. Jean Baptiste Electric Light Company, held at their offices recently, the following gentlemen were appointed directors: The Hon. L. Tourville and Messrs. Arthur Caron, O. Marin, Charles Chaput, O. Vanier, Joseph Girard, A. Lalonde, E. David and P. Terreault. Mr. O. Marin, N. P., was subsequently elected president. The company's offices are at No. 379 Montana street.

St. John, N. B.—Mr. C. D. Jones, manager of the Consolidated Electric Company, states that all the electric plant of the Canada Electric Company has arrived in this city and will be put in the electric car sheds, on Main street. This is the plant of a company that for some time carried on the manufacture of electrical supplies at Amherst. The Consolidated Company hope soon to be manufacturing all sorts of electrical apparatus and to find a good market in Canada for all their goods. Mr. Jones has just returned from Boston, where the managers of the company have purchased a complete apparatus for the manufacture of electrical wire, either bare or insulated. The plant will be brought here at once and placed with the other apparatus in the vacant car sheds. The insulated wire to be manufactured will be that invented by Messrs. Knudson & Cuttress, and which is now in general use. These new industries will give employment to a large number of hands.

Montreal, May 13. J. A. C.

OUR CHICAGO LETTER.

The Electric Fountains, at the west end of the Grand Basin, will be put in operation for the first time Saturday night this week.

The Nutting Electric Manufacturing Company has secured new quarters for manufacturing at 128 and 130 South Clinton street, and is rapidly recovering from its loss by fire, which occurred a short time ago. Preparations are being made for the extensive manufacture of the Nutting arc lamp for all the various purposes.

Director-General Davis took his first ride in the electric launch which is to be devoted to his exclusive use this summer, on Wednesday this week The boat is made of mahogany and the colonel was delighted with his beautiful craft. Accompanied by Vice-President E. J. Moore, of the Launch Company, Director of Works Burnham and Assistant Director of Works Graham, a tour was made of the lagoons, and the trip much enjoyed by all.

An Announcement that the electric lights would be turned on Monday night, May 8, resulted in drawing a large crowd to the park to witness the beautiful spectacle. Although the buildings surrounding the Grand Basin only were lighted, the sight was one of grandeur, which entranced those who witnessed it. The basin was brilliantly lighted and the gondolas and electric launches which slipped in silence through the water, and the effect of the search-light casting rays upon the many beautiful objects surrounding the basin, made a sight never to be forgotten by those present. The following order was issued from the Department of Electricity Tuesday this week:

Exhibitors in this department are unnecessarily behind in the completion of their exhibits.

The department has taken every possible precaution to aid them, and wherever possible has taken upon itself unusual responsibilities and labor to this end.

The department has provided all night lighting in the building, hoping that exhibitors would take advantage of the fact to work overtime and double shifts of men. This has not been done, and the department declines to suffer further criticism from the management of the Exposition, and from the public, on account of the dereliction on the part of the exhibitors.

The Director-General has fixed May 13 as the date by which all installation work must cease. It is, therefore, determined by this department to fix May 14 as the extreme limit of time for receiving and completing the installation of exhibits. All exhibits not absolutely complete on that date will remain during the period of the Exposition in an unfinished state. J. P. BARRETT,
Chief Department of Electricity.

Chicago, May 13, 1893. M. J. B.

PERSONAL.

Prof. Henry A. Rowland, of Johns Hopkins University, Baltimore, has been elected a member of the French Academy.

The Belgian government has granted an annuity of $600 to the widow of the late M. Van Rysselberghe, the well known electrician.

Mr. D. D. Dickey, of the Faraday Carbon Company, was in New York last week. Mr. Dickey is one of the hard working manufacturers who grows younger as the years pass by.

Messrs. J. S. Cummings, B. E. Sunny, G. K. Wheeler and W. J. Ballard, of Chicago, are in Dubuque, Ia., for the purpose of organizing the Dubuque Light and Traction Company.

Mr. Henry A. Clark, general manager and treasurer of the Eastern Electric Cable Company, Boston, was in New York on business last week. Mr. Clark is a gentleman of ability and earnestness who has made many friends in the electrical field, in which he is one of the pioneer manufacturers.

Mr. John English, of Bridgeport and New Haven, Conn., projected his pleasant personage on an innocent New York public last week and was warmly welcomed. Mr. English has large electric lighting interests in Connecticut, and is an active and progressive believer in the rapid development of electric light and power.

Annual Report of the Board of Directors of the Westinghouse Electric and Manufacturing Company to the Stockholders.

At the annual meeting of the board of directors of the Westinghouse Electric and Manufacturing Company, held at Pittsburgh on May 17, the following report was submitted to the stockholders of the company:

OFFICE OF WESTINGHOUSE ELECTRIC AND MANUFACTURING CO.,
PITTSBURGH, PA., May 17, 1893.

To the stockholders of the Westinghouse Electric and Manufacturing Company:

Your board presents herewith its financial statement for the year ending March 31, 1893.

It will be seen that there has been a profit from manufacturing of $1,491,817.13, and from other sources of $112,766.60, making a total for the year of $1,604,583.73. This is after charging to operating expenses the following amounts: $84,747.31 for alterations and additions to buildings; $155,484.87 for maintaining the machinery and tools in the highest order, and $58,188.86 for interest and discount.

The year began with large orders, but with only a moderate manufacturing capacity and a proportionate stock of material on hand, so that the above earnings were made under unfavorable circumstances, due to the fact that the capacity of the works and the material in stock and in process had to be more than doubled during a steadily increasing press of business.

During the year the company has manufactured and installed at the World's Fair in Chicago an electric lighting and power plant, consisting of 12 generators of 15,000 lights capacity each, two of 4,000 lights capacity each, one 750 horse-power generator, and several smaller ones. Six of the large generators are driven by engines having their shafts connected directly to those of the generators. This plant is the largest ever installed.

These generators mark a new era in electric light and power distribution. They are of the "two-phase" type, designed to drive Tesla motors, and at the same time to operate both arc and incandescent lamps, thus making the one form of generator useful for three purposes.

The total capacity of the plant exceeds the contract requirements sufficiently to meet the demands that may be made by exhibitors for extra lights.

The company will also have at the Fair an extensive exhibit of its other forms of apparatus.

The stopper lamps now being manufactured in the company's Allegheny City works are being used exclusively in connection with the apparatus at the World's Fair. It is gratifying to be able to announce that in the manufacture of the Sawyer-Man stopper lamps all of the advantages anticipated have been fully realized. The low cost of manufacture and the high efficiency of these lamps, together with the ability to renew their carbon burners, enables the company to sell lamps at lower prices than can be afforded by any other manufacturer. To meet the demand a new factory has been equipped with special machinery designed for the purpose, and already has a daily capacity of 5,000 lamps, which is being rapidly increased and will be shortly quadrupled. The expenses incident to the establishment of this new lamp factory have been charged to the business of the past year. This branch will hereafter add materially to the volume and profit of the company's business.

The success of the stopper lamp, its low cost of manufacture, and the fact that it is the discovery, prior to Edison's patents, of inventors whose patents belong to our company, have turned a temporary check into a great business advantage.

Our competitors have copied our plans and infringed many of our patents, notably those relating to power transmission, and many important details essential to the successful operation of alternating current apparatus for the distribution of electricity for light and power purposes, for which we have brought suits for infringement.

The confidence expressed in the last annual report in the superior merit of the apparatus of the company, and in the strength and value of its patents, has been fully justified by the results of the year's operations; and we feel no apprehension as to the outcome of suits now pending or which may be brought by its competitors.

Your directors have been brought face to face with the fact that the business of the company has outgrown the present capacity of its factories, and that large savings could be effected if the manufacture were carried on in new works equipped with the latest devices for handling its product by machinery.

In view of the favorable result of the past year's business, and of the volume of orders in hand, and the future outlook, your directors have not hesitated to accept a proposition from the East Pittsburgh Improvement Company to sell to your company a site of 23 acres most favorably located with reference to railway facilities. The Improvement Company has agreed to erect on this site buildings and works according to the plans and under the supervision of the officers of your company, and to sell them to the company at their actual cost, not, however, to exceed $500,000 above the price of the land, and have agreed to take pay therefor in quarterly payments of $25,000 and interest, beginning January 1, 1894. Your officers have estimated that the savings to be effected by the manufacture of its products in the new works, will, on a most conservative basis, be more than double the amount of the quarterly payments. Thus, these new and complete works will be acquired without the expenditure of fresh capital, leaving the proceeds from the sale of the company's present property as working capital, without taking into account the manifold business advantages that will arise from the centralization of its manufacturing operations.

The results of the past year's business have shown that our apparatus can be sold for cash to responsible parties, and that the prevailing belief that long credits must be given, or that stocks and bonds must necessarily be taken in order to secure business, is not correct. Your officers and agents have found that low cash prices and good apparatus are sufficient inducements to secure all the trade the company can care for.

Although the profits of the business might have justified the payment of dividends on all of the stock of the company, the directors have thought it wise to pursue a very conservative policy, especially in view of the large expenditures required during the past year for machinery and material, and of similar expenditures which the present prosperous condition of the company's business may make necessary in the near future. Both the results and the prospects are so encouraging that the directors believe the stockholders will uphold them in a course which places the company in a position of undoubted financial strength, and which will assure the permanent continuance of dividends when once begun.

For the Board,
GEORGE WESTINGHOUSE, JR.,
President.

Westinghouse Electric and Manufacturing Company balance sheet, March 31, 1893:

ASSETS.		
Cash in banks		$212,573 85
Bills receivable		366,228 47
Accounts receivable		2,289,982 70
Material in stock and in process of manufacture (at cost of labor and material)		1,414,662 31
Advances to leased companies		138,573 06
Bonds (par value $369,100)		358,197 15
Stocks (par value $6,469,257)		4,069,439 96
Real estate and buildings		453,037 96
Machinery and tools		710,023 61
Miscellaneous		60,055 54
Charters, franchises, patents, etc.		4,378,031 69
Total assets		$14,450,806 32
LIABILITIES.		
Accounts payable		$569,660 48
Bills payable, issued for merchandise.		376,003 64
Discounted with collateral		931,884 51
CONTRACT AND CONTINGENT LIABILITIES.		
Scrip dividend		194,562 00
Stock subscriptions		13,125 00
U. S. E. Ltg. Co.'s six per cent. 15 year bonds, $50,000 payable annually (Bills receivable under discount, $482,054 49.)		600,000 00
CAPITAL STOCK.		
Preferred, 73,378 shares	$3,668,940 50	
Assenting, 103,146 shares	5,157,331 00	
Common, 3,633 shares	181,650 00	
(In treasury, 6,621 shares preferred; 13,229 shares assenting.)		9,007,921 50
SURPLUS.		
Balance, March 31, 1892	$1,880,445 20	
Twelve mos. net earnings from business	$1,491,817 13	
From other sources	112,766 60	
	1,604,583 73	
	$3,485,028 93	
Less amount written off in adjustment of matters pending in 1890 and 1891	$221,228 05	
Ditto in current year.	98,869 65	
	420,097 70	
	$3,064,931 23	
Interest on bonds	$39,000 00	
Interest on scrip	11,673 72	
Dividends	256,608 32	
	307,282 04	
		2,757,649 19
		$14,450,806 32

Sails for London.

Mr. James Kempster, the well known printer and publisher, has decided to take a rest and visit his former home in England. Mr. Kempster will leave on S. S. "Anchoria," from foot of Twenty-fourth street, on Saturday of this week at 9 A. M. A large number of his electrical friends will be present to wish him a pleasant voyage.

Telephonic Conversation Counter.

A somewhat novel and interesting apparatus to be used as a conversation counter in telephone exchanges is shown and described in a recent issue of the *Elektrotechnische Anzeiger*. Numerous patents for conversation counters or registers have been taken out in Europe as well as in the United States, but none have completely met the several requirements. At first sight the problem appears simple enough, but anyone who has carefully looked into the matter will readily admit that a real first-class conversation counter, though undoubtedly being a desideratum for every exchange manager, has not yet been invented. Mechanical as well as electrical devices of the simplest and withal most efficient character must be employed; moreover, their automatic operation should be absolutely reliable. One of the principal difficulties which the successful inventor must overcome consists in the necessity of so arranging his apparatus that, though it will faithfully register every complete connection or conversation, it must *not* operate when the called subscriber fails to respond or is absent from his office.

In this connection attention is called to the D. R. patent No. 66,869, granted to Messrs. Butzke & Ludwig, which discloses an arrangement by which each complete connection is automatically recorded; in addition thereto a stamp is impressed upon the moving ribbon giving the time (day-hour-minute) and length of duration of a conversation.

An examination of the subjoined diagram shows a paper ribbon b wound around a cylinder a, which ribbon by means of clockwork e is drawn over two guide pulleys g beneath two writing devices c and d, and is finally placed on cylinder f. The writing device c prints upon one side of b, while the other registering device d prints on the back of the paper; c gives the time commencing with the moment when the calling party has been connected by the exchange operator with the called subscriber, and continues to register not only until the subscribers stop talking, but until the operator disconnects the lines. On the other hand d gives the time which is occupied from the coming in of the call at the exchange until the desired connection is established.

The paper ribbon moves two mm. per minute. Therefore its length, reckoning 15 hours daily use per month (say from 7 A. M. to 10 P. M.) should be 2+60+15+30=54m. This length is subdivided into hours so that when the stylus of c or d marks the ribbon, the time may be directly read off in minutes.

Of course, the ribbon can be of any desired width, and thus it may be worked in connection with several writing devices; or, in other words one clockwork is sufficient for a number of subscribers. Each subscriber requires, however, individual writing devices c and d, and these may be operated either mechanically, electrically or mechano-electrically.

In the figure a mechanical device is shown. It consists of an elastic spring k, carrying a writing point or stylus l, which normally, by means of lever m, is lifted from the paper. To the lever m is attached a wire n, in turn connected to lever v, which is operated by the introduction of plug p. The writing device is an electrical one and consists of an electro-magnet r, whose armature s carries lever t and stylus n. The circuit connection for this device is not shown in the diagram, but it is supposed that it becomes active whenever a call comes in, *i. e.*, by the removal of the telephone from the hook, and continues in operation until the desired connection has been established.

Although the patent states that as soon as the electro-magnet r has become excited, attracting thereby its armature and pressing stylus n against the ribbon b, it fails to show how the stylus remains pressed against the ribbon when the call current ceases.

Upon the receipt of a call the operator raises plug p which permits spring o to move upwards, thereby reducing the tension on wire n. This action causes lever m to fall, freeing k and permitting stylus l to touch the ribbon b. At the same time electro-magnet r is cut out of the circuit, and thus d becomes inoperative.

At the close of the conversation plug p is withdrawn from the socket and returned to its original position, which act places wire n again in tension and by means of lever m lifts l from c. Of course these conversation counters are to be placed only at main offices.

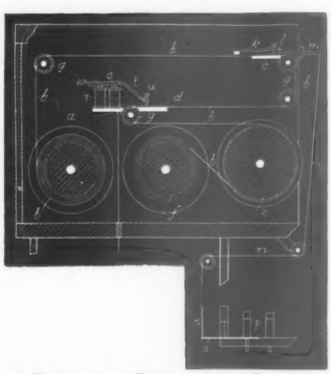
Frank Geraldy vs. W. H. Preece.

(*La Lumiere Electrique, April* 15, 1893.)

Mr. Frank Geraldy, the well known French electrician, replies editorially to certain statements of Mr. Preece contained in his recent Victorian address. The writer opens his scathing refutation of Mr. Preece's "anglo-saxon-all-claiming-tendencies" by a little anecdote.

A Frenchman talking to an Englishman made the courteous remark: "Sir, if I were not a Frenchman, I would like to be an Englishman." "But I," replied the son of Albion, "if I were not already an Englishman, would desire to be one." This, says Mr. Geraldy, well characterizes the condition of Mr. Preece's mind. He then continues as follows:

"In his *resumé* of the development of electric power transmission none but Englishmen are mentioned. Certainly this fact shows a spirit of laudible patriotism, though the chauvinism displayed thereby is at least of questionable taste; the introduction of national feeling in purely scientific matters is, however, to be regretted. Mr. Preece attributes the original idea or the conception of electric power transmission to a certain Mr. Pinkus, who in 1840 astonished the world by an announcement that he intended to run an electric tramcar by current derived from primary batteries. I confess I have not the pleasure of knowing Mr. Pinkus, and I suspect my readers may be equally ignorant of his existence. He is one of the illustrious unknown ones whose existence has been revealed by Mr. Preece."



A TELEPHONIC CONVERSATION COUNTER.

Mr. Geraldy then mentions that Jacobi, in 1839, made the first trial of an electric motor on the Neva, and that his experiment was followed by 33 years of inactivity in the field of electric power transmission.

"Mr. Preece kindly mentions that in 1873, Fontaine, in Vienna, perceived and demonstrated the reversibility of the dynamo," but, he adds, "probably he stumbled on that discovery."

Mr. Geraldy continues: "What a pity! Surely, if Mr. Fontaine had been an Englishman that would not have happened; we may be certain that the experiment would have been the outcome of long meditation and the work of a genius. Nine years thereafter we hear that Mr. Gisbert Kapp discovered that it was possible to get constant speed at the motor under extreme variations of load, if the generator and motor were series machines and had characteristic curves which corresponded to each other. And did nothing else take place during these nine years? Was not Mr. Kapp's discovery, if we chose to call it a discovery, originally made in Vienna? And lest some one may impute ignorance of a prior inventor to Mr. Preece, we desire to point out that, according to his own method of investigation, it is not allowed to omit the names of prior inventor's-witness, Mr. Pinkus. True, Mr. Kapp has given us a theory in which the characteristic plays a leading role, but he did not discover the characteristic curve. This discovery might be attributed to Hopkinson, who demonstrated its importance in 1879, and it may be well here to point out that Mr. Hopkinson is also an Englishman. The true discoverer is, however, Marcel Deprez. His memoir, sent to the Academy, December 7, 1881, discloses the entire subject.

That portion of his memoir in which he defines and employs the characteristic curve is particularly remarkable on account of the number and variety of deductions which the author drew from the proposition; in fact, as far as constant currents are concerned, M. Deprez covered the subject completely. I wish to state, however, that the corollary, the discovery of which Mr. Preece attributes to Mr. G. Kapp, is not so stated in the memoir. I do not desire to detract an iota from the scientific labors of that gentleman, but I believe it to be true that his discovery was well known to those who had studied M. Deprez' memoir. In fact, we find the following sentence among the concluding remarks: "We may, for example, by means of the characteristic, consider the two dynamos, the one as a generator and the other as a receiver."

Mr. Preece cannot have forgotten these facts; he was present at the Congress when the paper was read and discussed; nay, he congratulated M. Deprez upon his excellent work. Why then, omit to mention his name? I can only allege one reason. M. Deprez is *not* an Englishman; he *is* a Frenchman to the backbone; was born in Chatillon-sur-Loing, near Orleans, and I do believe has never thought of becoming a citizen of Fair Albion. Plainly, this is *his* fault and *his* great misfortune.

We omit the following paragraphs, and, in conclusion, add Mr. Geraldy's opinion of Mr. Preece's hostile attitude towards mathematical electricians. Mr. Preece said:

"The advance of our knowledge in this branch of electrical development has been very much retarded by the phantasies of visionary mathematicians, who monopolize the columns of our technical literature and fill the mind of the student with false conclusions. I have no sympathy with the pure mathematician who scorns the practical man, scoffs at his experience, directs the universe from his couch and invents laws to suit his fads."

This statement arouses Mr. Geraldy's indignation. He asks:

"Rien que cela? Is that all? No one who knows me will accuse me of overestimating the value of mathematical work. I fully realize the danger and the unreliability of mathematical work which is based upon false premises, but this very fault simply shows the enormous utility of mathematics; and, while it is, of course, necessary to guard against such inaccuracies, I gladly acknowledge and admire the immense service which mathematicians are rendering daily to science. Mr. Preece is not imbued with similar sentiments. It appears that he nurses a secret hatred against mathematicians. However that may be, he has widely overshot his mark; for a person without any idea of theory cannot contribute to the advancement of science; he is but a laborer, and at best a skillful mechanic. In this connection it is interesting to find that Mr. Preece is himself somewhat of a philosopher; he talks animatedly about molecules, the ether theory, etc., and concludes with a grand encomium on Clerk Maxwell.

"It would be well if the memory of this great man might teach Mr. Preece to show a little more *leniency* to those who follow in Maxwell's footsteps and a little more *justice* to foreign scientists."

Telephone Progress in St. Louis.

The failure of the Bell Telephone Company to secure a franchise for an underground conduit in which to carry its wires has brought about an extensive change in its plans, which will soon be put in operation, says the St. Louis *Globe-Democrat*. Among these is a branch central station, to be located at Teresa and Lindell avenues, to handle the business west of Garrison avenue and north of Chouteau. The plans have been in contemplation by General Manager George F. Durant for sometime, and the details have been in course of perfection for several weeks. The necessity of this departure is the increase of business. There are now something like 100 business and residence applications on file which cannot be filled. There are now so many wires and cables that it would be impossible to carry them down town and into the operating room at Fourth and Pine streets. In the district referred to there are something like 1,000 wires, and the branch now being established is calculated to take about 300, though only about 150 will be cut in at the start.

In the changes St. Louis will be original. Branch centrals are operated in other cities, and wherever there is a branch central there is a trunk system.

The departure being made by Manager Durant is in the employment of a code of incandescent signals. As he says, it looks as simple as falling off a log, on paper, and in theory, but it remains to be seen how it will be in practice after the machinery is put in motion. The only word passed between the "hello" at one end of the trunk line and the "hello" at the other end is the number of the telephone desired. In the code there are four lights or lamps of different degrees of brilliancy. There is the dark, the normal, the white and the medium. The district central, for instance, is handling Mrs. Brown's call. The full white light is the call and answer, the number is given and the connection is made. When she has completed her conversation with Mr. Brown she rings off just as at present, district central disconnecting over the trunk line by means of the light, which goes back to the normal. The brilliancy of the lamp also tells the operators whether or not the wire is busy Thus, though half a dozen operators are working at the same table it is not necessary to ask a single question or speak a single word. Otherwise a confusion of tongues and great delay would result. These signals are known as regulars—that is, they are such as are used in answering calls and making disconnections. Then there is a set of signals called irregulars by which grounded wires, etc., are shown. They are all intended to secure the greatest amount of service, and of the most rapid character, out of a given wire capacity.

The lights for the code of signals will be furnished from storage batteries, charged from small dynamos operated by the company. A change will also be made from the cellular batteries now used to the storage batteries, which are rendered necessary for making the lights for the signals. The storage battery will, of course, only be put up in the central, and will not in any way affect the battery in the box of the instrument. The changes will all be marked departures, particularly that for operating the trunk line system. This particularly will be watched by managers of the telephone systems in all of the large cities. The trunk lines themselves are in common use, but the method of utilizing and handling them is very bungling compared to this one. The others have a system of disconnecting, but this is about all. On the smoothness with which the apparatus works will also depend the establishment of other branch centrals in this city. If it is as successful as is anticipated, district centrals will soon be established north and south. Not only can a great deal more business be done, but wires will be available in the central portion of the city which are now overloaded with business. The Teresa and Lindell avenues central will make a number of wires available which are now very necessary for business altogether east of Garrison avenue. Patrons have never as yet been solicited, but with 100 applications now on file, largely from residences, the number of patrons can be nearly doubled as soon as the services can be given.

The officers of the telephone company still appreciate the fact that the time is coming when all wires will be under ground, but since the defeat of their conduit bill by the lower house of the last municipal assembly, they have not yet decided as to the introduction of another bill. They may again ask for a conduit, and they may not. In the meantime the operating room remains at Fourth and Pine streets, and the tables for the new apparatus are being erected there. The operating room at the company's own building, on Tenth and Olive streets, was constructed on plans made for a conduit, but if the underground system is finally given up, it can be used just as well for bringing cables in overhead. The tax on poles which the United States Supreme Court has decided, in the case of the Western Union, can be assessed by the city, can in no way affect the telephone company. It is licensed under the mercantile and manufacturing schedule, being assessed 5 per cent. of its gross receipts. This sum will be much larger this year than last. This tax, Mr. Durant says, he thinks, is the largest paid by any corporation in the country.

Fire-Proof Power Stations.

The designing and building of power stations, not only for electric lighting, but for all classes of buildings where electric power is developed, is assuming very important proportions. In the case of an electric light company or an electric street railway company, if the power stops the revenue stops. Fire not only destroys property but it shuts off absolutely all sources of revenue, so that it is of the utmost importance that these power stations should be built as nearly

FIG. 1.—INTERIOR VIEW OF PAWTUCKET, R. I., GAS COMPANY'S DYNAMO ROOM.

fire-proof as it is possible. Time has demonstrated that no building is absolutely fire-proof when surrounded by buildings of a combustible construction or when filled with combustible material. Generally speaking, power stations are located so as not to be surrounded by buildings of a combustible construction, and there is no earthly need for any combustible material to be stored in these stations. Under these circumstances, the construction of a station which is fire-proof in every way is not impossible. Indeed, we are able to illustrate on this page four stations which are absolutely fire-proof for the reason that there is no woodwork about the buildings to take fire. Among the pioneers in this class of construction is The Berlin Iron Bridge Company, of East Berlin, Conn., and to them we are indebted for the illustrations which we here produce.

Fig. 1 is an interior view in the dynamo room of the Pawtucket Gas Company's new plant, at Pawtucket, R. I. The Berlin Iron Bridge Company designed and built the roofs on the entire plant for the Pawtucket Gas Company. The dynamo room is 60 feet in width and is 150 feet in length. The side walls are of brick, the roof being of iron covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron roofing. This construction is particularly adapted for dynamo rooms for the reason that, while being absolutely fire-proof, the corrugated iron is so protected that the Berlin Company guarantee that no moisture will condense on the underside in all changes of temperature, or in the most severe winter weather. The first roof of any importance upon which the Berlin Company used this construction was the Narragansett Electric Lighting Company, at Providence, R. I. This station has been built some five years, and during that time not a drop of water has ever condensed on the underside of the corrugated iron, so that experience proves that the Berlin Company are justified in guaranteeing that no moisture will drop from the underside of a roof constructed after this pattern.

Fig. 2 is an interior view in the engine room of the Narragansett Electric Lighting Company, at Providence, R. I. This engine room is 67 feet in width and 200 feet in length, the side walls being of brick and the roof of iron, covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron roof covering. The Narragansett Electric Lighting Company's plant at Providence, R. I., was designed by the well-known electrical engineers, Remington & Henthorn, and is probably one of the most complete and perfect, as well as economical plants, in the United States. All the roofs on this plant were furnished by the Berlin Company, and are of the same pattern as that shown in the above illustration, which is taken direct from a photograph in the interior of the engine room.

Fig. 3 is an interior view in the dynamo room of the United States Electric Lighting Company, at Washington, D. C., and shows an iron roof which is of the same general construction as that noted and described above for the Pawtucket and Providence stations. The covering is the same patent anti-condensation corrugated iron, and, although the roof has been in use some four years now, no trouble whatever has been experienced from any moisture dripping from the underside of the corrugated iron roofing.

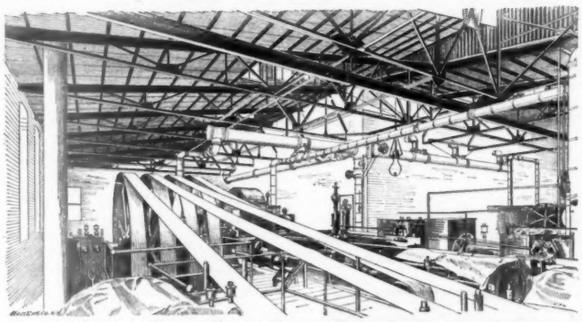


FIG. 3.—DYNAMO ROOM, UNITED STATES ELECTRIC LIGHTING COMPANY, WASHINGTON, D. C.

Fig. 4 is an interior view in the dynamo room of the Elmira Illuminating Company, at Elmira, N. Y. This plant is similar in construction to the other three plants above described, all the buildings being of brick, and all the roofs being covered with the Berlin Bridge Company's patent anti-condensation corrugated iron, supported by iron roof trusses and iron purlins. The above illustration was taken from a photograph immediately after the iron roof and the traveling crane were placed, and while the machinery was being placed, before it had been started in operation, and is here given not so much to show the arrangement of the machinery as the construction of the building.

These buildings, as noted, are covered with corrugated iron, and are absolutely fire-proof, for the reason that there is nothing about the construction to take fire. Heretofore, the great trouble with corrugated iron has been on account of condensation on the underside during cold weather, and many companies have been inveigled into using corrugated iron on account of its fire-proof qualities, only to find that in cold weather the damage from water dripping from the underside of the roof was even worse than the damage by fire. Experience seems to have proved that the Berlin Iron Bridge Company, of East Berlin, Conn., have successfully solved this problem, which has for a long time been the source of a great deal of study and experiment by engineers.

State Taxation of Street Railway Companies in Pennsylvania.

BY HOMER SHOEMAKER.

Every street railway company in Pennsylvania is required annually, in the month of November, to report to the auditor-general, on blanks furnished by the state, regarding its capital, par value of stock, dividends, net earnings, loans, etc., from which reports the auditor-general calculates the amount of tax due the commonwealth and sets forth the same in what is technically called a "settlement" against the company. Under the present revenue laws a tax of five mills on the dollar is imposed on the actual value of the capital stock of all kinds. The "actual value" is ascertained by two of the officers of the corporation in the following way: The two designated officers between the first and 15th days of November of each year estimate and appraise the capital stock of their company at its actual value in cash, not less, however, than the average price which said stock sold for during said year, and not less than the price or value indicated or measured by net earnings or by the amount of profit made and either declared in dividends or carried into surplus or sinking fund. The auditor-general has lately become dissatisfied with the valuation placed on the stock of most of the corporations of the State by their officers, and has, together with the State treasurer, taxed them in accordance with a valuation made by these State officers, which they believe corresponds with their "net earnings." A great many appeals are being taken from such settlements.

It is also made the duty of the treasurer of a street railway company doing business in this State, upon the payment of any interest on any scrip, bond, or certificate of indebtedness issued by such company to residents of this commonwealth, and held by them, to deduct four mills on every dollar of the interest paid as aforesaid, and return the same into the State treasury within 15 days after December 31 of each year. The treasurers of street railroad companies are also required to make, under oath, a report of the amount of gross receipts derived from business done within the State during the preceding six months ending on the first days of January and July in each year. Against this amount the accounting officers of the State make a settlement of eight mills on the dollar, which is payable on the last days of January and July.

When the auditor-general has made a "settlement" against a company, he sends the same, with the reports relating thereto, to the State treasurer, who approves or disapproves the settlement. If he disapproves, his reasons are stated in writing and together with the settlement and the reasons of the auditor-general are laid before the Governor, whose determination is conclusive as to said officers, who must thereupon readjust the account in accordance therewith. In case the corporation fails to report to the auditor-general, that official may examine the books of the corporation to get the information desired in the reports, or he may, in conjunction with the State treasurer, estimate the tax supposed to be due from the company and add thereto 50 per cent. to protect the State from any loss which might result from the failure of the corporation to furnish the proper reports.

When a settlement has been made, a certified copy of the same is sent to the corporation, which if not satisfied, may appeal to the court of Dauphin county, the county wherein the State capitol is situated. The appeal must be filed in the office of the auditor-general within 60 days after the company receives notice of the settlement. The case then assumes the form of a suit by the commonwealth against the corporation, the burden being on the commonwealth to establish its claim. The appeals are usually tried under the act of 1874, without the intervention of a jury. The settlement is final against the company except as to the parts appealed from. Either party to the suit may appeal from the findings of law of the Dauphin county court to the supreme court of the State. The court costs in such appeals are light.

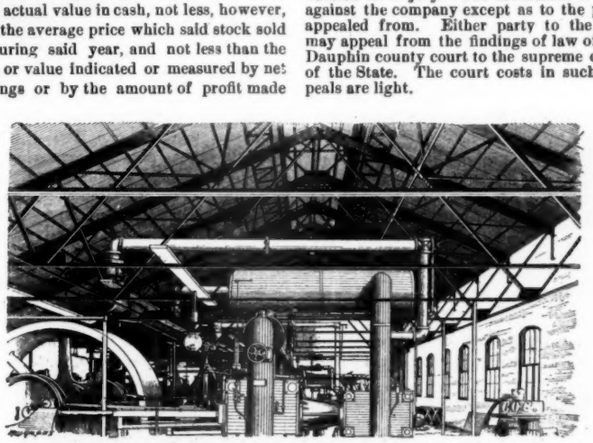


FIG. 2.—NARRAGANSETT ELECTRIC LIGHTING COMPANY'S ENGINE ROOM, PROVIDENCE, R. I.

Tax found to be due the commonwealth must be paid to the State treasurer. Receipts for such payments, to be valid, must be signed by the State treasurer or some person known to be in his employ and for whom he is answerable, and countersigned by the auditor-general.

Street railway companies incorporated under the act of May 14, 1889, are required to make an annual report to the auditor-general according to the form prescribed by him, embracing in detail the operations and affairs of the said corporation during the preceding year, up to and including October 31, and such other information as the auditor-general shall desire. This report must be sworn to by the treasurer of the corporation and forwarded to the auditor-general by December 1 of each year. A penalty of $500 is imposed upon companies failing to make the report.

Owing to the fact that the corporation tax laws are often drawn by "grangers," and are revised, amended or supplemented at almost every session of the legislature, it is often quite difficult to tell exactly the amount of tax a particular corporation is obliged by law to pay. Many of the companies save money and avoid litigation by having some one who has given special attention to the study of the tax laws examine their reports before they are filed with the auditor-general, and see that the various items are so classified and arranged as to gain the advantage of the decisions of the courts which pass on tax cases.

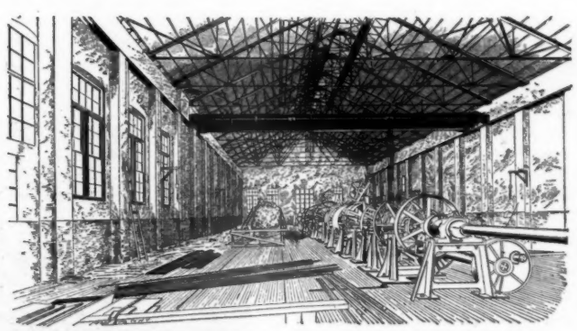


FIG. 4.—ELMIRA, N. Y., ILLUMINATING COMPANY'S DYNAMO ROOM.

ELECTRIC RAILWAY AND POWER NOTES.

The survey of the electric road from Findlay to Fostoria, O., *via* Van Buren, is complete.

A syndicate, composed chiefly of Western men, have purchased a controlling interest in the Standard Electrical Company, of Detroit, manufacturers of the Standard storage battery.

The Newtonville and Watertown, Mass., Street Railway Company will commence work on its line through Walnut and Watertown streets, in Newton, at once, and it is hoped the road will be in operation by the middle of August.

The Consolidated Street Railway Company, of Worcester, Mass. have asked for bids for the new power-house in New Worcester. The work of reconstructing the tracks on Main and Lincoln streets will be begun as soon as the weather permits.

The south side electric transit lines in Chicago will be in running order by the 20th of the month. The great engine-house on Wabash avenue, between Fifty-second and Fifty-third streets, is now fully equipped with the machinery and the fires will soon be built.

The General Electric Company, of New York, through the Grand Rapids Electric Company, has closed a contract with the Western Michigan Electric Company for the electrical apparatus to be used in the transmission of electrical power from Lowell, Michigan.

The conductors and motormen on the Schuylkill, Pa., Electric Railway receive $1.26 for a day, or shift, of nine hours. They must be at their post in every kind of weather and always on their feet, and yet many men have applied for positions on the cars who have better positions elsewhere.

The car house and power house of the Grand View Beach electric road, which runs along the shore of Lake Ontario, near Rochester, for several miles, were burned on May 11. Thirteen out of 14 cars, 500 tons of coal stored for the summer traffic, and all the tools and appliances were destroyed. The loss is $60,000, but is covered by insurance.

By the middle of the summer, President Lewis, of the Brooklyn City Railroad, predicts, there will not be a horse attached to a car on any of his roads. Track master King, with the aid of 700 laborers, will start work on Myrtle avenue and prepare it for the trolley. In a few weeks time the power station for the Myrtle avenue division will be finished.

It has been decided by the Milwaukee and Wauwatosa, Wisconsin, Motor Railway Company to equip the line between the city and village with electricity just as soon as it can be done. Contracts for furnishing the power for the line will be made with the city company and the company operating the Wauwatosa plant, so that plenty of power will be assured.

President Norton of the Atlantic Avenue Railroad Company, of Brooklyn, said last week that there were now being operated 16 trolley cars on the Bergen street line of the road, and that the next line to be opened would be the Butler street. The delay in getting the trolley cars running is now, he said, caused by the inability of the company to get cars enough.

The city council of Fargo, N. D., at a meeting last week passed the electric street railway ordinance on its first reading. Securities are required that the work will be commenced within a certain time. The ordinance was also considered by the Moorhead council, but the latter took no action. The proposed line will run between Fargo and Moorhead and out to the Fargo court house. Power will be furnished by a new electric light company.

A special meeting of the stockholders of the East St. Louis Electric Railroad was held last week in St. Louis. The capital stock was increased from $150,000 to $500,000. John Scullin, the St. Louis Street Railway magnate, resigned as president and director of the company. Henry D. Lixton was chosen president, and Harry Scullin, a son of the former president, was selected as a director to fill the vacancy caused by the resignation. The increase of the capital stock is for the purpose of making extensions and improvements.

After long delay, the Seventh Avenue Railroad Company, of Brooklyn, has obtained the consent of the property owners to the introduction of the trolley system on that line, and trolley poles were erected last week in that avenue. The principal opposition came from that part of Seventh avenue which lies between Flatbush avenue and Stirling place. Here there are many wealthy residents, who thought the trolley wire would be unsightly and lower the tone of the neighborhood past all redemption. It is expected that the trolley cars will begin running in July. Four hundred of them will be required, and work on them is being pushed forward rapidly.

The stockholders of the Atlantic Avenue Railroad Company, of Brooklyn, met last week in the Franklin Building for the purpose of leasing the Brooklyn, Bath and West End Railroad. This property was purchased by the syndicate which controls the Brooklyn Traction Company last fall. Its capital stock was $600,000 and its bonded indebtedness was about the same sum. Secretary Richardson said that the lease was granted for a term of 25 years, the Atlantic Avenue Company guaranteeing the bonds. The trolley system, which is being pushed forward as rapidly as possible on the Brooklyn, Bath and West End Railroad, is not expected to be ready for the summer traffic.

A fire which broke out in the Power building, a great six story structure on Third street, near Green, in Louisville, Ky., shortly before midnight on May 3, destroyed and damaged 35 buildings, causing a loss of between $300,000 and $400,000. The plant of the Louisville Steam and Electric Power Company, six floors, soon fell in, crushing the adjoining buildings, also the office of the Christian Observer, across the street. With the exception of the power building, the structures destroyed and damaged were two and three stories high, not very valuable buildings. The greatest losers are the Louisville Steam and Electric Power Company, building and plants, $150,000, insurance $65,000, and the tenants of the power building, whose losses aggregate $175,000; insurance unknown. The origin of the fire is unknown.

FIG. 4.—SIDE VIEW OF REGULATING SWITCH.

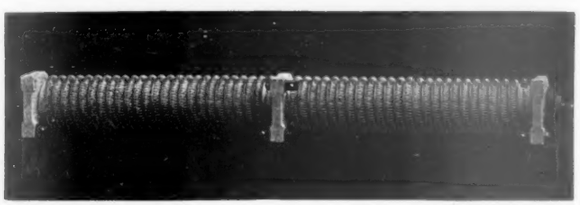


FIG. 1.—THE CONSOLIDATED CAR HEATING COMPANY'S HEATER COIL.

FIG. 2.—HEATER IN BOX.

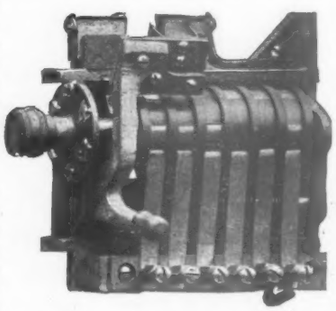


FIG. 3.—FRONT VIEW OF REGULATING SWITCH.

FIG. 5.—EXTERIOR OF REGULATING SWITCH BOX.

Light and Power for New York State.

The Niagara Falls Power Company has made a contract with the Cataract Electric Companies of Rochester and Jamestown to furnish power. The right to furnish electrical power all over the State has been granted the Power Company in the amendment to its charter passed by the last legislature and approved by Governor Flower on April 25. Section 2 of this amendment gives the Power Company the right "to conduct, convey and furnish the water of the Niagara river, but not in excess of the amount heretofore expressly authorized by law, or any power, heat, or light developed therefrom, to, in, and through any civil division of this State, and to sell, furnish and deliver the same to any and all bodies or persons, public or private, wherever situated." This gives the Niagara Falls Power Company the great Empire State as its field to operate in. In the original charter their field of operation was confined to Erie and Niagara counties.

Improvements in Car Heating Devices.

The Consolidated Car Heating Company, of Albany, N. Y., have put on the market several ingenious electric car heating devices, which are illustrated in the accompanying engravings. It has now become a recognized fact that car heating by electricity is so far superior to the crude and inefficient car stove, that every attempt to furnish better and more efficient apparatus will be welcomed by railroad men generally. The devices manufactured by this company are intended for use on trolley lines.

Fig. 1 represents a car heater proper, which consists of a porcelain insulator stand about 30 inches long, having spiral grooves around it, in which is wound 625 feet of wire. By maintaining a rather low degree of heat and increasing the quantity by having a great number of feet of wire, they prevent oxidation, and thereby maintain the efficiency of these heating conductors for a much longer period than that where a greater heat is maintained, which causes the detrimental oxidation.

Fig. 2 represents the heater enclosed in a box which is lined with mill-board asbestos having perforations to allow of the even distribution of the heat. Each car contains six heaters arranged three under each seat, and by their controlling device they are enabled to maintain any degree of heat which they deem sufficient.

Figs. 3 and 4 show their regulation switch which allows for the use of currents from two to 12 amperes.

Fig. 5 shows the exterior of their regulating switch-box arranged so that but little instruction is necessary to the conductors, who are often bothered with complicated devices.

The company claim for their apparatus a minimum expenditure of power, perfect cleanliness and calculate that the additional fuel used in the boilers will be of such small consequence that the cost of heating a car in the coldest weather would not be much more than 10 cents per hour.

Suburban Underwriters' Association.

The Suburban Underwriters' Association of New York State has recently made an extension of its territory by having transferred from the middle department of underwriters the following territory of New Jersey: Essex, Union, Middlesex, Bergen, Morris, Sussex, Passaic, Somerset, Warren and Hunterdon counties. This Association has also adopted the revised and codified rules of the Underwriters' International Electric Association, and it will be of interest for electric light companies, contractors and others to send to the Association's office, 44 Pine street, New York city, for copies of rules and regulations. This new territory will be looked after by the Association's consulting electrician, Mr. Fremont Wilson.

Brooklyn Institute.

The following officers were last week elected by the Electrical Department of the Brooklyn Institute for the ensuing year: James Hamblet, president; William S. Barstow and J. P. Windringham, vice-presidents; Edward H. Lyon, secretary; and J. C. Reilly, treasurer. Roger S. White was substituted for W. A. Mosscrop in the Committee on Electric Lighting, Mr. Sinclair for R. N. Bayles in that on electromotors, and A. J. Watts, M.D., added to the Committee on Electrometallurgy. A lecture on "Electric Meters" was delivered by Mr. Barstow, illustrated by blackboard diagrams and examples of every form of meter, foreign and domestic.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

WINDSOR, ONT.—The City Railway Company, of Windsor; capital, $250,000. Incorporators, James Anderson, John Pulling, W. Johnston McKee, John Davis and John Coventry.

BETHLEHEM, PA.—The Bethlehem and Catasauqua Traction Company has been incorporated with a capital of $60,000.

HANNIBAL, MO.—An electric railway is to be constructed from Hannibal to Palmyra, and thence to Philadelphia, a distance of 20 miles.

SEATTLE, WASH.—The West Side Traction Company; capital, $5,000. Incorporators, T. F. Beidler, of Cleveland; H. R. Bean, of Chicago; C. P. Bassett, of Newark; Hugh L. Thomas, R. W. Emmons, John S. Patterson and H. Chapin, of Seattle. The company will construct a street railway in the west side.

CONNERSVILLE, IND.—The Connersville Street Railway Company has been incorporated with a capital of $25,000.

SING SING, N. Y.—The Ossining Electric Railway Company; capital $50,000. Incorporators, John V. Cockcroft, H. McGonegal and Sumner R. Stone. This company has right of way to build a street railway from Spring street in Sing Sing to Sparta.

HUNTINGTON, LONG ISLAND.—The Huntington Electric Light, Heat and Power Company; capital $20,000. Incorporators, Walter Lindsay, William H. Stoyle, Charles B. Scudder and Philip Pearsall.

ROCHESTER, N. Y.—A syndicate has been formed for the purpose of building a double track electric road to Windsor Beach. Among those interested are J. N. Beckley, William Purcell, Frederick W. Smith, Bernard Dunn and Frank S. Upton.

BRIDGETON, N. J.—The South Jersey Traction Company; capital, $400,000. Incorporators, Walter H. Bacon, of Bridgeton; Richard W. Clay and Geo. Wood, of Philadelphia. The company has contracted for the purchase of the property and franchise of the Bridgeton Rapid Transit Company and the Bridgeton and Millville Turnpike Company, and will succeed them in establishing trolley railways in Bridgeton and along the turnpike to Millville. The new company will lease the franchise of the Millville Rapid Transit Company.

PORTLAND, ME.—The Portland Street Railroad Company will build a new power station.

WILKESBARRE, PA.—The Wilkesbarre and East Side Railway Company; capital, $50,000. The company proposes to build a five mile electric railway to Pittston. The line will be operated by the Wyoming Traction Company.

CAMDEN, N. J.—The Camden, Gloucester and Woodbury Electric Railroad Company; capital, $600,000, has been incorporated by William J. Thompson, Thomas P. Curley, David Baird, J. Willard Morgan and others. It is announced that the road will be completed to Gloucester city by July 4.

PHILADELPHIA, PA.—The Electric Traction Company, of Philadelphia; capital, $5,000. Incorporators, Jeremiah J. Sullivan, Alfred Smith, Charles E. Ellis, H. T. Potts and Alexander M.

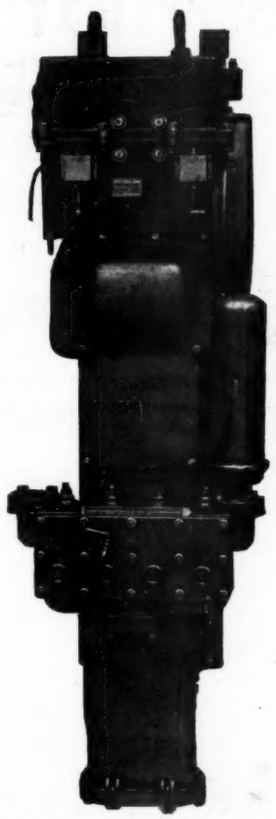


FIG. 1.—GENERAL ELECTRIC COMPANY'S DUPLEX SINKING PUMP.

Fox. The general office of the company will be at 2591 Kensington avenue.

DOVER, DEL.—The Citizens' Light, Heat and Power Company has been granted power by the legislature to build an electric line in Dover.

DUBUQUE, IOWA.—The Dubuque Light and Traction Company, successor to the Dubuque Light and Power Company, has filed articles of incorporation.

BEAVER FALLS, PA.—New Castle, Beaver Falls and Sharon capitalists are contemplating a new electric line to connect the various systems in the Shenango Valley.

WATERLOO, IND.—An Indianapolis syndicate is trying to secure right-of-way for an electric railway to be built from Garrett to Auburn and thence to Waterloo and Ashley.

WABASH, IND.—Preliminary steps have been taken for the organization of a street railway company. James McCrea heads the directory.

SPOKANE, WASH.—A new electric line will be constructed from Spokane to Granite Lake, nine miles west of the city.

FRANKFORD, DEL.—The Fenwick Island Company has been granted permission to build an electric railroad from Frankford to the Island for which the company is named.

NEW YORK CITY.—The Automatic Electric Railway Signal Company, of New York city; capital, $3,000. Directors, Charles A. Senior, Jr., of New York city; William R. Robins, of Ozone Park; and Charles S. Langhurst, of Brooklyn.

SYRACUSE, N. Y.—E. W. Emmons, representing the New York Electrical Works, is trying to organize a company to build an electric railway from Syracuse to Fayetteville.

FREMONT, O.—The city council has granted the Put-in-Bay Southwestern Electric Railroad Company a franchise to run through Fremont.

CAMDEN, N. J.—The Camden Horse Railroad Company will introduce the trolley system on its Fifth street line.

MALDEN, MASS.—The East Middlesex Street Railway has passed into the control of the North Shore Traction Company, and it is understood that the new company will equip all the lines with electricity.

LANCASTER, PA.—The entire electric street railway system of this city, including the line to Millersville, has been purchased by the Lancaster and Philadelphia Electric Railway Company. The latter corporation was recently refused the right-of-way over the city streets.

Electric Light and Power.

HANOVER, PA.—The Hanover Light, Heat and Power Company; capital, $25,000, has filed articles of incorporation.

ST. CLOUD, MINN.—The Water, Light and Power Company; capital, $500,000. Incorporators, F. E. Searle, William Westermann, Jesse A. Chase and C. S. Benson.

MONTREAL, CAN.—The Royal Electric Light Company will change from steam to water power.

RICHMOND, MO.—The Richmond Electric Light Company; capital $18,000. Incorporators, Thomas N. Lavelock, Robert Hughes and John Gibson.

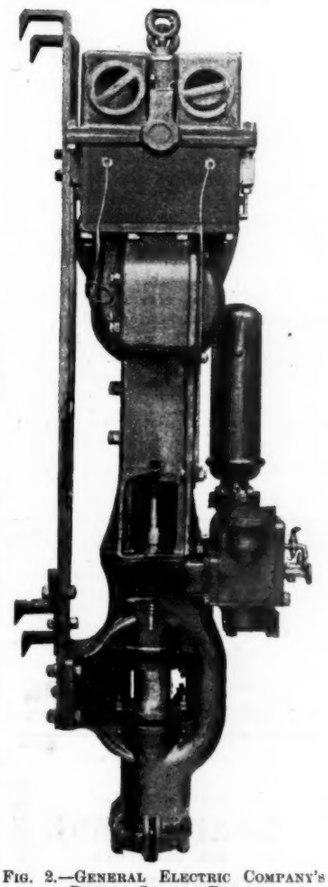


FIG. 2.—GENERAL ELECTRIC COMPANY'S DUPLEX SINKING PUMP.

OTTAWA, OHIO.—The Electric Light Company of Ottawa has been incorporated with a capital of $30,000.

CLEVELAND, OHIO.—Within a few months the Cleveland Electric Company will expend $500,000 on its works. The power house will ultimately have a frontage of 227 feet, and will have a capacity for 100,000 incandescents, 2,000 arcs and 1,000 horse-power for power service.

PRICEBURG, PA.—The Priceburg Electric Light Company has been incorporated with a capital of $20,000.

OAKLAND, MD.—The Mountain Telephone and Electric Company has been organized by Dr. Henry W. McComas, president; Charles S. Davis, treasurer; and J. C. Peddicord, secretary. The company will build a telephone line from Oakland to all the other towns in the county.

CHICAGO, ILL.—The New York Electric Company; capital, $25,000. Incorporators, J. W. Fierstone, G. W. Bryson and C. J. Beadham.

SEATTLE, WASH.—The Union Electric Company will erect a large power house at a cost of $60,000.

MANCHESTER, CONN.—The Waring Electric Lamp Company; capital, $50,000. Incorporators, N. T. Pulsifer, of Manchester; A. D. Coffin and J. H. Walker, of Boston. The company will manufacture an incandescent electric lamp to be known as the Waring Novak.

NORWOOD PARK, ILL.—The Norwood Construction and Electric Company, for the construction and operation of electric light and power plant; capital, $20,000. Incorporators, E. B. Smith, N. Sampson and James A. Low.

DENVER, COLO.—The Columbian Electrical Works; capital, $50,000. Incorporators, H. W. Lawrence, J. R. Knowland, H. H. Metcalf and C. Pierson.

OTTAWA, ONT.—The Automatic Telephone and Electric Company, incorporated last month, proposes to run a copper metallic trunk line direct from Halifax to Vancouver, over 3,500 miles. Local plants will be established in towns and cities *en route*.

Increase of Capital Stock.

CANTON, O.—The Canton-Salem Electric Company, only recently organized, has increased its capital from $30,000 to $150,000. The company has secured a charter to build an electric road from Canton to Salem.

OLEAN, N. Y.—The stockholders of the Olean Street Railway Company have voted to increase the capital from $16,000 to $120,000.

General Electric Company's Duplex Electric Sinking Pump.

The difficulties heretofore met with in obtaining an electric sinking pump at once light in weight, compact in form, of good capacity and efficiency, and not liable to damage from moisture or hard usage, have been successfully overcome in the pump illustrated herewith. The motor with gearing and operating mechanism is entirely contained in a cast-steel casing, absolutely water-tight. The pumps are of the duplex double acting type, with outside packed plungers. The only moving parts visible are short sections of the plungers and rods. All wearing parts are readily accessible for examination and can be quickly and easily replaced. This pump is not susceptible to damage from water, and its form is such that it will stand considerable hard usage without injury. It will work as well under water as out of it—in fact, rather better, the cooling action of the water increasing the efficiency of the electric motor. If, therefore, the precaution is taken to use thoroughly insulated cables for conveying the electric energy to this pump, it may be "drowned" by a sudden rush of water in the mine and still continue operating. Even should the case leak slightly, the motor in the upper part of the case, within a waterproof chamber of its own and separated from the gearing, would remain long unaffected. There are no exposed working parts liable to damage, or to cause injury to those who may be working about the pump. This pump is economical in the use of power and has a very high efficiency. It has a capacity of 125 gallons per minute against a vertical head of 200 feet, occupies a space of only 24x26x86 inches, and weighs complete 3,000 pounds. Pumps of this type are manufactured in various sizes, and are put on the market by the General Electric Company, of Boston and New York.

The Direct U. S. Cable Company, for the better convenience of their patrons, have removed their Glasgow, Scotland, office from 40 Hope street to more commodious quarters at 4 Waterloo street, opposite the Corn Exchange.

The New Power Plant of the Alameda Street Railway Company, Alameda, Cal., will contain two 150 horse-power Ball tandem compound condensing engines, built by the Ball Engine Company, Erie, Pa. The Everett Street Railway Company, Everett, Wash., have purchased from the Ball Engine Company, Erie, Pa., three cross compound condensing engines, 100, 150 and 200 horse-power.

The Berlin Iron Bridge Company, of East Berlin, Conn., have issued a most complete and satisfactory catalogue, illustrating and describing many of the buildings and bridges they have constructed. The range of iron construction work which this company undertakes is very wide, and the quantity is an evidence of the quality. They have been especially successful with fire proof, iron construction, power houses for electric light and railway companies.

The New York Insulated Wire Company has issued a World's Fair edition of its very complete catalogue describing the Grimshaw white core wires, Grimshaw tape and splicing compound and Vulca electrical wire ducts. The fact that these products were used exclusively for the installation of nearly 100,000 incandescent lamps at the World's Fair, and the fact that they have been used in many United States government buildings, including the Capitol and White House at Washington, has led the New York Insulated Wire Company to designate them as the "Nation's Choice."

Pope, Read & Rogers.

This is the title of a recently organized firm of patent attorneys and solicitors who have opened elegant offices in the new Taylor building, 39 and 41 Cortlandt street, New York city, where they have every requisite facility for the prompt dispatch of any business which may be entrusted to their care.

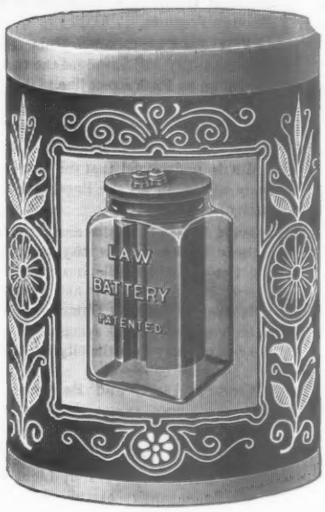
Mr. Franklin Leonard Pope, the head of the new firm, is so well known as a patent attorney and electrical engineer as to need no words of commendation at our hands. His reputation and ability have placed him in the front rank of his profession.

The second member of the firm is Mr. Robert H. Read, formerly examiner in the department of electricity in the United States Patent Office, and who for years past has conducted with marked ability and success the Patent Bureau of the ELECTRICAL REVIEW. As an expert practitioner in the abstruse and difficult departments of electrical work, especially alternating and multiphase machinery and distribution, Mr. Read has won a deservedly high professional reputation.

Mr. Edward H. Rogers, formerly counsel for the Westinghouse Electric & Manufacturing Company, and favorably known to the profession from his connection with some of the more prominent electrical patent cases which have been before the Federal courts within the past few years, continues his association with Mr. Pope, so that his services may be availed of in the prosecution or defense of actions for infringement, or for advice relating thereto.

The long and varied experience of both Mr. Pope and Mr. Read especially fit them to obtain adequate and complete patent protection for complicated, difficult and important inventions.

While the ELECTRICAL REVIEW regrets extremely to lose so valuable a member of its staff as Mr. Read, it wishes him the fullest success in his new connection.



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Kerite Cable News.

Mr. J. E. Ham, of the New York office of W. R. Brixey, has just contracted to manufacture and lay for the Metropolitan Telephone & Telegraph Company two Day's Kerite, No. 18 conductor, submarine cables, similar to the nine other Kerite cables previously furnished, and which are now in service between New York city and Jersey City, under the North River.

Mr. W. R. Brixey has just returned from an extended visit to Chicago, where he has been looking after the preparation of his World's Fair exhibit. This is now completed, and Day's Kerite has the honor of being the first wire exhibit in the Electricity Building in readiness.

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Special Announcement.

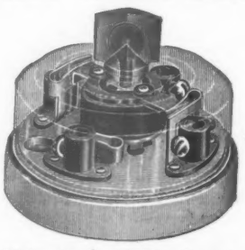
On and after May 1st, 1893, the business of the ELECTRICAL REVIEW PATENT BUREAU will be transferred to POPE, READ & ROGERS, 41 CORTLANDT STREET, NEW YORK CITY. This department of the ELECTRICAL REVIEW will be discontinued. The ELECTRICAL REVIEW commends the patrons who have heretofore placed their patent business in its hands to the new firm, with the assurance that their interests will be carefully guarded, and the highest grade of professional service will be rendered.

The ELECTRICAL REVIEW,
by CHAS. W. PRICE, *President.*
THE ELECTRICAL REVIEW PATENT BUREAU,
by ROBT. H. READ, *Manager.*

The undersigned have taken offices in the new TAYLOR BUILDING, 41 CORTLANDT STREET. Clients and others interested are requested to note the change.

POPE, READ & ROGERS.

HART SWITCHES



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"In covering the ground which comes most properly under the title, the properties of telephone lines, I have endeavored, so far as possible, to avoid mathematics, and to treat the subject in a way which would prove most interesting and instructive to the general reader as well as to the student. Where it has seemed best to put in a mathematical demonstration, it has been put in a footnote.

"The results of investigations in regard to the properties of telephone lines, I have endeavored to state clearly in a general discussion. They are not susceptible of tabulation, and the most important properties it is impossible to formulate exactly.

"I have treated rather fully the questions of interference with the telephone currents from outside sources, especially the troubles from electric railways; for my practice in that direction, during the last four or five years, has been considerable, and enables me to deal with that subject in the light of personal experience. This question is still of considerable importance in this country, and its treatment here may be of assistance to managers of exchanges in practical work.

"It was my intention that the book should be one which would prove useful to the practical man, as well as that it should serve as a basis for a lecture course to students. I have therefore thought it best to introduce some matter in which correct elementary ideas of matter and energy are developed, so as to lead up to the most modern conception of the method of propagation of electro-magnetic disturbances."

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